May 14, 1956 50 Cents

# AVIATION WEEK

A McGRAW-HILL PUBLICATION

Douglas RB-66s for USAF

## Avionic Engineering Manpower Surveyed

## Next Satellite Problem: Getting Data to Earth

*First in Constant Speed Drives...*

SUNDSTRAND

**F-100D new electrical concept stemming from Sundstrand Constant Speed Drives**

North American's F-100D, Air Force fighter-bomber, has new auto-pilot developed expressly for supersonic jets. To power this and many other electronic and electrical devices necessitates the newest concept in electrical systems. Sundstrand Constant Speed Drives provide an automatic constant frequency a-c system having plenty of stable power under all flight conditions. Heavy overload capacity assures reliable power for optimum operation of electronic devices. This is another example of how the new concept in electrical systems . . . fostered by Sundstrand's Constant Speed Drive . . . meets the challenge of today's . . . and tomorrow's . . . fast, high-flying jet aircraft.

**New Electrical Horizons . . .**

are opening to design engineers, through co-operation between engine and airframe manufacturers and Sundstrand. With this new concept in electrical systems, expect remarkable advances in operation and performance of tomorrow's aircraft.

# SUNDSTRAND AVIATION

Division of Sundstrand Machine Tool Company, ROCKFORD, ILLINOIS  Western District Office: Hawthorne, California

**CONSTANT SPEED DRIVES • AIRCRAFT ACCESSORIES**

# HUGE HELICOPTERS

## by HUGHES and VERTOL*

# RELY ON GOODYEAR!

The staunch reliability of Goodyear Aviation Products is dramatically illustrated by their use in two of the world's largest helicopters.

TIRES, WHEELS, BRAKES and ROTOR BRAKES are among Goodyear's contributions to the new XH-17 heavy-duty cargo transport built by the Hughes Tool Company of Culver City, California.

PLIOCEL, BULLET-SEALING FUEL TANKS and OIL CELLS built by Goodyear are mainstays of the fuel system of the famed H-21 Work Horse Helicopters produced by Vertol Aircraft Corporation in Morton, Pennsylvania, which are also equipped with Goodyear wheels, brakes and tires.

The broad acceptance of Goodyear Aviation Products throughout the aeronautics industry stems from pioneer service which began back in 1911.

Today this acceptance is embodied in the fact that *More Aircraft* — the world over — *Land On Goodyear Tires, Wheels and Brakes Than On Any Other Kind.*

In fuel cells, as in a host of other Goodyear developments, the record is equally impressive.

For information, we invite you to write: Goodyear, Aviation Products Division, Akron 16, Ohio, or Los Angeles 54, California.

* *Formerly Piasecki*

FACILITIES + ABILITIES = EXTRA *plus* IN PERFORMANCE

GOODYEAR AVIATION PRODUCTS

Pliocel—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

*Design, Development, Production*

# CASE HISTORIES

*of Weber Aircraft Corporation*

*subject:*
**EJECTION SEATS FOR B-52**

*Weber Aircraft Corporation, 2820 Ontario Street, Burbank, California*

## AIR FORCE'S MIGHTIEST BOMBER EQUIPPED WITH WEBER EJECTION SEATS

Eight years in development, Boeing's B-52 is the Air Force's largest and fastest jet bomber, capable of flying a bomb load to the other side of the world and return. The giant, eight-jet, swept-wing aircraft, now in quantity production in Boeing plants at Seattle and Wichita, is equipped with Weber pilot, co-pilot and crew ejection seats.

*Latest type ejection seats*

The Stratofortress, designed to be the USAF Strategic Air Command's front line heavy bombardment aircraft, has the latest type of ejection seats so that the crew member has only to pull the "go" handle to find himself floating out in space. The seats, similar to Weber seats in Boeing's 6-jet B-47 medium bomber, feature extensive use of aluminum forgings for extra rigidity and light weight. An electro-mechanical actuating device makes seat adjustment quick and simple. Stowable arm rests can be folded down out of the way to provide extra arm space. Foot rests provide additional safety.

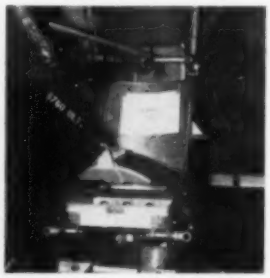
*Static and functional tests*

During the prototype phase, the seats were put through intensive static and functional tests at the Weber test facility and firing range. In production, they are the subject of meticulous quality control. Each seat is checked out under simulated ejection conditions before delivery. Every electrical and mechanical function is carefully tested on special stands.

*Weber participates in accelerated program*

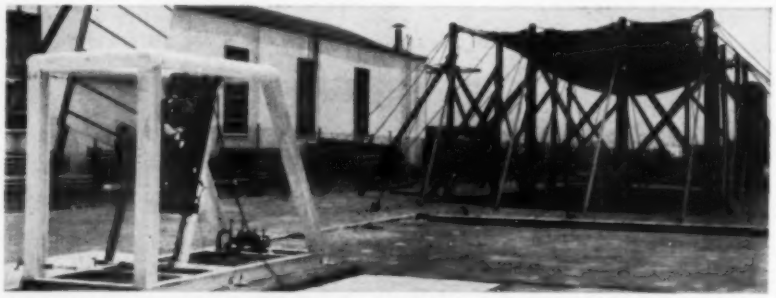
Weber is proud to be one of the manufacturers selected to participate in the accelerated B-52 program. Weber also manufactures the forward crew floor and nose assemblies as a sub-contractor to Boeing Wichita.

Eight Pratt & Whitney J57 jet engines develop approximately 100,000 pounds of thrust to propel the Boeing B-52 Stratofortress at more than 650 miles per hour.



Pilot, co-pilot and crew seats designed and produced by Weber feature aluminum forgings developed for optimum weight/strength ratio.

George Robinson, Weber sales engineer, and Arnold Johnson, Weber vice-president, meet with Boeing's Glen Mills at Wichita, Kansas, to witness the roll-out of the first Wichita-built B-52D, which is equipped with Weber ejection seats.



At the Weber test facility in Burbank, a B-52 ejection seat is subjected to instrumented operational tests, one phase of Weber's intensive test program.

*Manufacturers of:*
*Ejection Seats / Pilot and Crew Seats / Passenger Seats / Buffets, Wash Basins and Other Interior Equipment / Aerostands / Airframe Sub-assemblies*

WEBER AIRCRAFT CORPORATION, 2820 ONTARIO STREET, BURBANK, CALIFORNIA

## AVIATION CALENDAR

**May 16-18**—Society for Experimental Stress Analysis, spring meeting, William Penn Hotel, Pittsburgh, Pa.

**May 17-19**—New York State Society of Professional Engineers, 30th Engineering Industries Exposition and annual convention, Statler Hotel, New York.

**May 18**—Armed Forces Day Dinner, Sheraton-Park Hotel, Wash., D. C.

**May 19**—Airspace Forum, sponsored by National Pilots' Association, Westchester County Airport, New York.

**May 21**—Annual meeting of the Daniel Guggenheim Medal Board of Award, University Club, 1 W. 54 St., New York.

**May 22-23**—Symposium on Reliable Applications of Electron Tubes, sponsored by Radio Electronic Television Manufacturers Assn., University of Pennsylvania, Philadelphia.

**May 24-26**—Armed Forces Communications and Electronics Association, 10th national convention, Boston, Mass.

**May 30-June 3**—Eighth Annual Wright Memorial Glider Meet, sponsored by The Soaring Society of Dayton, Dayton.

**June 2**—Seventh Annual Maintenance & Operations Meeting, Reading Aviation Service, Inc., Reading Municipal Airport, Reading, Pa.

**June 3-8**—Society of Automotive Engineers, summer meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

**June 4**—National Fire Protection Association Seminar on Jet Speed with Fire Safety, Hotel Statler, Boston, Mass.

**June 5-6**—Spring Assembly Radio Technical Commission for Aeronautics, Hotel Statler, Boston.

**June 11-15**—Society of the Plastics Industry, Seventh National Plastics Exposition, New Coliseum, New York, N. Y.

**June 13**—B. F. Goodrich Technical Forum, co-sponsored by Atlantic Aviation Corp. and Airwork Corp., Atlantic Aviation Hangar, Teterboro Airport, Teterboro.

**June 17-21**—American Society of Mechanical Engineers, semi-annual meeting, Hotel Statler, Cleveland, Ohio.

**June 25-27**—High Temperature Symposium, Berkeley Campus, University of California.


**AVIATION WEEK • MAY 14, 1956**

**Vol. 64, No. 20**

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# At Your Service... Hydrospin

*A few of the typical shapes of metal parts which have been Hydrospun.*

## Take Advantage of This Power Spinning Process and Cut Your Manufacturing Costs

A Cincinnati Hydrospin machine is now in operation at Kaiser Metal Products, Inc., and is available to missile, jet engine and other manufacturers for development and production work.

Under high compressive forces, rollers form an inexpensive flat blank or simple preform to the shape of a rotating mandrel, usually completing a part in one pass. Movement of the roller brackets is controlled by hydraulic tracer and makes possible irregular wall thickness and curved wall shapes. Strength characteristics are improved and finish is excellent.

### Savings Take Many Forms

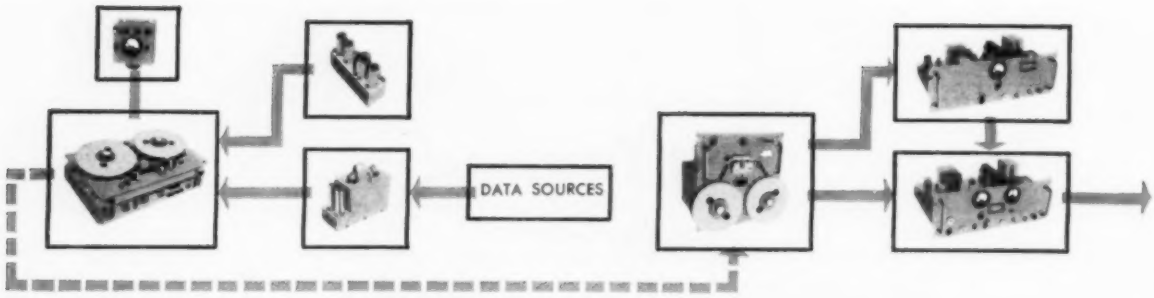
Forming by this economical method obsoletes many chip cutting operations with resulting savings in labor, material and machines. One manufacturer has made savings of 100 lbs. of critical high temperature alloy in one jet engine part alone. Another development on a missile part shows savings of 40% in material over draw die method and saves weight of the finished part by control of wall thickness.

A wide range of metals has been successfully Hydrospun and, as the above photograph shows, an unlimited variety of tubular, conical and hemispherical shapes is possible. Ask us about ways to put this Hydrospin to work for you in solving your manufacturing problems on hard-to-make, highly stressed parts. We can show you how to produce a better part at a definite cost saving. Write for brochure today. Address Dept. A.

*This Cincinnati Hydrospin, one of the few now in operation, may be the answer to your production problems.*

**Design Engineers: Take advantage of controlled wall thickness possible by this process and consider redesign for ultimate strength and weight savings.**

**KAISER METAL PRODUCTS, INC.**
BRISTOL, PA.




Block diagram of a typical FM carrier record-playback system, utilizing electronic wow and flutter compensation.

# ELIMINATING WOW and FLUTTER in magnetic tape data recording

## *"brute force vs. compensation"*

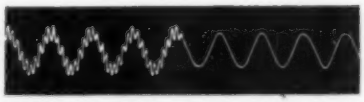
The careful transport design that reduced wow-and-flutter to a negligible factor in audio recording met with little success in critical data recording . . . despite superhuman efforts directed toward "perfect" transport design.

It isn't too difficult to see that even if a perfect transport were devised, it would be extremely costly, and limited to operation under only the most highly controlled conditions. That's why Davies bypasses this "head-on" or "brute-force" approach completely, and uses, instead, the surprisingly simple technique of *electronic* wow and flutter compensation.

As incorporated into a Davies magnetic tape data recording system, compensation *uses wow and flutter to eliminate itself.* A constant frequency reference signal is recorded simultaneously with the data signals on an adjacent channel. Any tape speed irregularity frequency-modulates the reference signal. On playback, the discriminated reference signal is merely added out of phase to the data signals, almost eliminating first order wow-and-flutter problems.

With compensation, overall system performance is never dependent on the transport. For that matter, many a job for which 0.1% rms wow and flutter recording without compensation would not prove sufficient, can easily be accomplished with a *0.5%* rms machine.

The illustration shows a sine wave, recorded on a transport with deliberately introduced 1% peak-to-peak wow and flutter. The uncompensated sine wave is to the left, and the compensated sine wave to the right of the line.



Oscillograph of sine wave, without (left) and with (right) compensation signal subtracted.

Further information on the role of compensation in magnetic tape data recording is provided in Bulletin 2901, "Wow and Flutter Compensation In Magnetic Tape Data Recording (FM Carrier Systems)", available on request to Davies Laboratories, Inc.

Davies LABORATORIES INCORPORATED
4705 Queensbury Road • Riverdale, Maryland

# "ENEMY" JET AT ONE O'CLOCK!

**The ultimate target** for a weapons system is the enemy. Lacking that ultimate target for training, the jet-powered Firebee has been developed by Ryan in cooperation with the U.S. Air Force, U.S. Navy, and U.S. Army. It is the first realistic target which can "stand-in" for the enemy to sharpen the sights of the pilots, gunners, missile crews and radarmen who man America's defense system. No other vehicle can be used so effectively to evaluate new weapons systems.

**Remotely controlled,** the Firebee is a jet-fast "flying bull's-eye" that can operate at the extremely high speeds and high altitudes of modern air combat. Launched from the air or ground, and recovered by parachute, it is economical, not only in original cost, but also throughout its extended operational life, because it can be used over and over again.

**Currently in production** and being used operationally, Firebees have been delivered to all three military services—Air Force (Q-2A), Navy (KDA-1) and Army (XM21).

**The Firebee** is dramatic proof of Ryan's skill in blending aerodynamic, jet propulsion and electronics knowledge to solve a complex aviation problem . . . meet a military need. Ryan's jet-powered VTO now being tested at Edwards Air Force Base is another example of Ryan's forward-looking engineering ability.

***Engineers looking for a challenging future will find outstanding opportunities at Ryan.***

*With a background of 33 years of experience in aviation, Ryan excels in designing and producing high quality aircraft, power plants and avionics, built at low cost, delivered on time.*

RYAN
AERONAUTICAL COMPANY
SAN DIEGO 12, CALIFORNIA

**THE Y-4 PERISCOPE BOMBSIGHT** *used in B-47 Stratojets has 3,433 parts, nearly 2,000 of them in this head-end assembly alone. General Mills manufactures this precision instrument in quantity under a USAF prime contract.*

*No need to swamp your staff with piece part and assembly problems...*

# Let General Mills supply the whole package

Eliminate the thousands of detail problems involved in turning out complete electro-mechanical assemblies—and save money, too!

The Mechanical Division of General Mills is ready to manufacture or purchase component parts, assemble to your requirements, and deliver assemblies performance-tested to rigid Government standards—on time. We have the experience and equipment required to take over the complete job. The highest precision standards are maintained in engineering, manufacture, quality control, packaging and accounting.

**LET US BID** on your requirements. Write, wire or phone: Dept. AW-11, Mechanical Division of General Mills, Inc., 1620 Central Ave., Minneapolis 13, Minn. STerling 9-8811.

*Job opportunities available for creative engineers. Work closely with outstanding men on interesting projects.*

## MECHANICAL DIVISION OF General Mills

**SONAR,** the underwater counterpart of Radar, provides the eyes and ears for our alert Navy.

Bendix-Pacific has long specialized in the design and production of both of these important strategic and specialized types of electronic detection systems.

If you have a problem in Radar or Sonar we will be glad to assist you. A qualified applications engineer in either field can call on you at your convenience.

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Bendix Aviation Corporation
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Four Cecostamps each working on a different piece. The one at the left is stamping cold rolled steel.

## ·CECOSTAMP·

The one left of center is stamping a wing skin of 24S.O. Aluminum. One in center is working on a firewall of 24S.O. Aluminum. One at extreme right is stamping tank parts.

Above is a close-up view of a Cecostamp producing a panel of cold rolled steel.

## ·CECOSTAMP·

This stamping is shown in the photograph below at the extreme left.

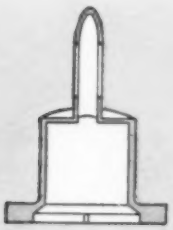
All photographs, courtesy Automotive Publications, Inc.

Stampings shown above are for aircraft and automotive use, made from a variety of metals and alloys.

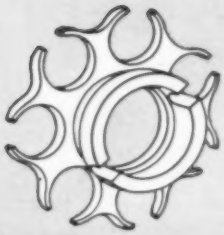
## ·CECOSTAMP·

Top stamping is of 24S.O. Aluminum. Others are of Terne Plate, Cold Rolled Steel and 61S.O. Aluminum.

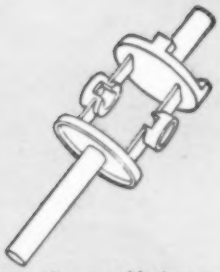
Have you the latest CECOSTAMP bulletin? Write CHAMBERSBURG ENGINEERING CO., Chambersburg, Pa.



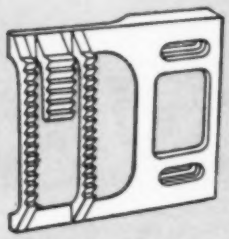
Here is an example of the complex internal coring possible with investment casting. Square, round, elliptical or irregular interiors can be cast.



The complexity of this part makes investment casting the only feasible method of manufacture. Prongs have perfect dimensional accuracy.



Here an entire assembly incorporating multiple functions is cast in one unit. "Keyhole" coring and a number of distinct surface details are required.

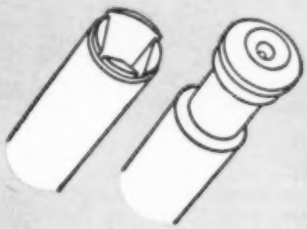


The sharp teeth of this sewing machine feed dog were cast in wear-resistant alloy to give longer wear than could be obtained from machinable material.

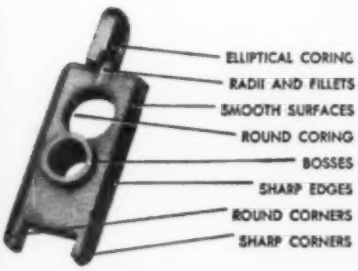
## design with **austenal** in mind

In planning parts, design directly for Microcast and take advantage of its wide range of design possibilities.

See not only what you can do, but what costly, time-consuming operations Austenal investment casting eliminates.

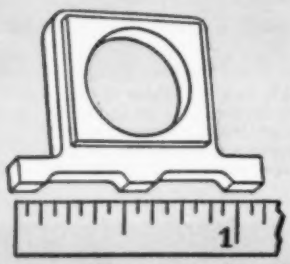


Cross-sections of irregular and varying thickness can be utilized. In this part the internal core diminishes from an irregular square to a small round hole.

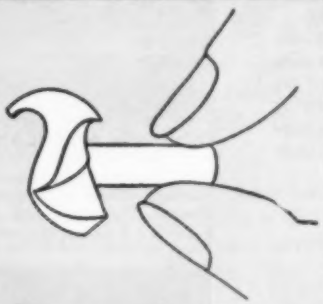


These extrusion dies of wear-resistant alloy are readily mass-produced with highly complex and irregular internal contouring.

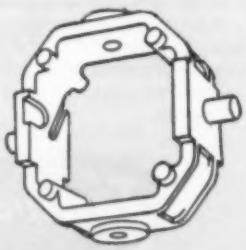
Walls of varying cross-sections are possible. Here wall thicknesses change from thin to very heavy, allowing strength without bulk.




This very small part measures 1⅛" wide and less than ⅛" thick. Its thinness, rigidity and detail were possible only by investment casting.



Shown here is an example of how investment casting can virtually eliminate hand-filing and machining by keeping uniform, intricate detail.



This large complex gimbal was cast to include many details on the internal and external surfaces.

**Design problem?**

**Call your Austenal representative and ask him to show you how Microcast can help you.**

PRECISION CASTINGS

**austenal**
LABORATORIES, INC.
**microcast division**
224 EAST 39th STREET, NEW YORK 16, N. Y.
7001 SOUTH CHICAGO AVE., CHICAGO 37, ILL.

**THE BOEING B-52 STRATOFORTRESS,** America's first jet intercontinental bomber, uses Fenwal Fire and Over-Heat Detectors, located in its eight engine pods. Set at 450°F, 675°F and 750°F, all with a tolerance of ±25°F, these Fenwal Fire and Over-Heat Detectors function the instant surrounding air temperature reaches the alarm point — no lag, no false alarms.

# FENWAL FIRE AND OVER-HEAT DETECTORS PROTECT EVERY TYPE OF AIRCRAFT

Fenwal Fire and Over-Heat Detectors are used in every type and size of plane, in every location where fire or excessive heat must be constantly guarded against and instantly indicated. These locations include main engine areas, auxiliary sections, cargo compartments, cabin heaters and inside wing areas.

Fenwal's unit system offers the advantage that electrical isolation of an individual Detector does not affect the functioning of the remaining units. Any Detector may be quickly removed and replaced without disturbing or removing the whole fire detection installation.

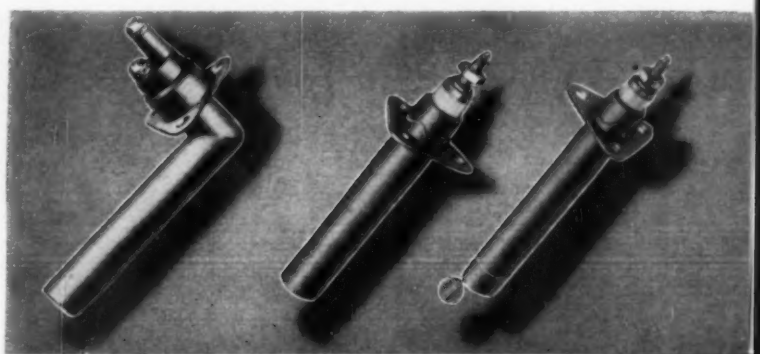
Fenwal Fire and Over-Heat Detectors are made for single-wire and double-wire loop circuits. A loop circuit enables each Detector to act independently in the event of accidental breakage in the electrical conductor. One push-button checks continuity of wiring in either type of circuit.

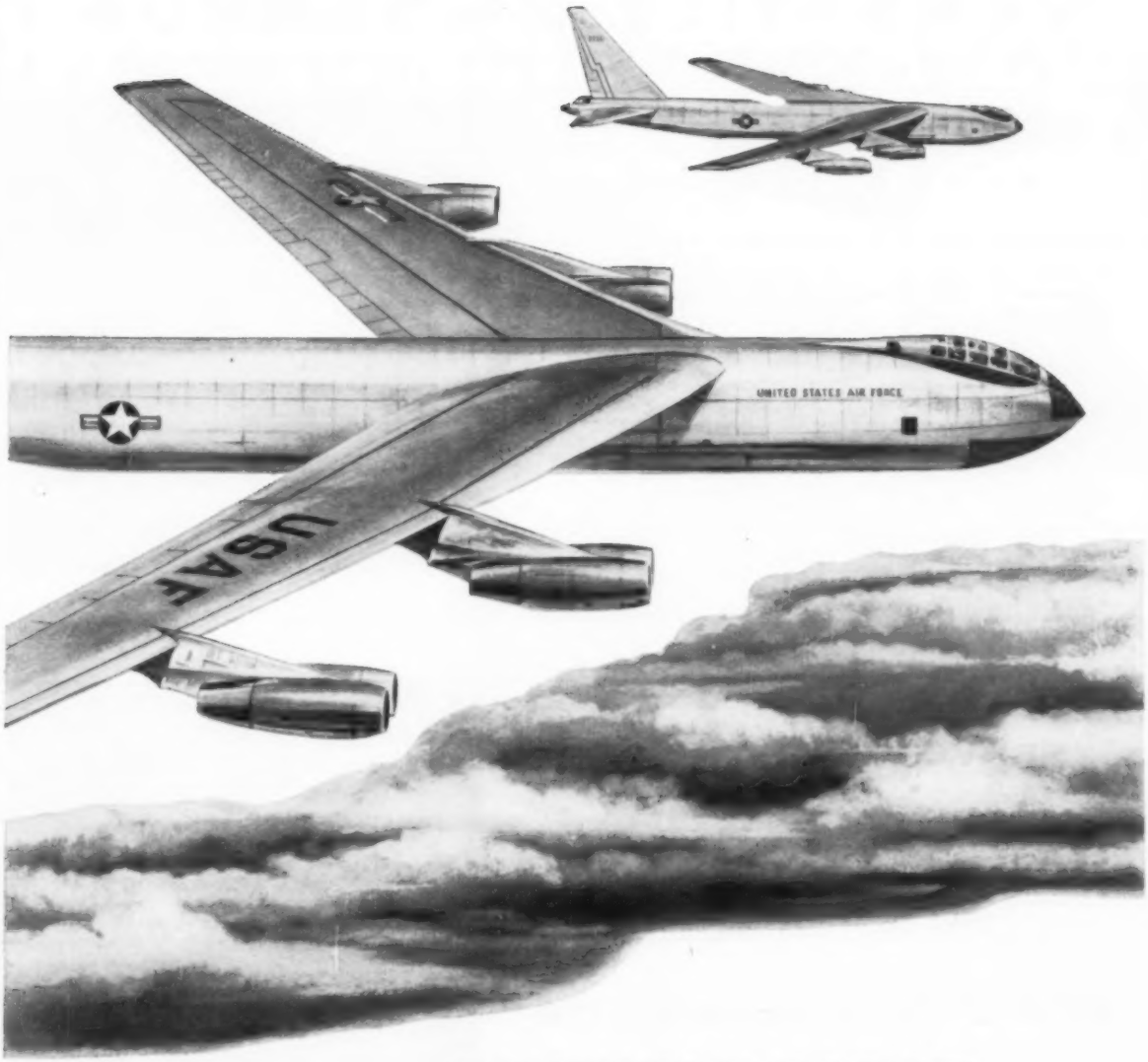
**THE NORTH AMERICAN F-100C SUPER SABRE,** first jet fighter to establish a world record for supersonic speed, depends on Fenwal Fire and Over-Heat Detectors for positive protection. Installed around the engine and fuselage, these units give warning *before* dangerous over-heating occurs. Fenwal Thermocouples are also used for temperature indication in the F-100C's J-57 jet engine.

**Fenwal**

**Controls Temperature . . . *Precisely***

**THE SHELL IS THE TEMPERATURE-SENSITIVE ELEMENT** in all Fenwal Fire and Over-Heat Detectors, giving positive, unfailingly accurate response. Compact and easily installed, these units are available in a wide range of designs, covering different temperature ranges and complying with all applicable military and government specifications. For complete facts write to **Fenwal Incorporated, Aviation Products Division, 125 Pleasant Street, Ashland, Mass.**






# RAYTHEON RADAR FOR THE B-52

Finding and smashing a bombing target through thick overcast when you are miles high, traveling at fantastic speeds, is no easy proposition.

To help solve this complex problem, the Air Force worked with Raytheon—a leader in both CW and pulse radar techniques and world's largest manufacturer of the magnetron and klystron tubes essential to radar.

Result? A precision radar of uncanny accuracy and outstanding reliability—a bombing radar which adds to the punch of this remarkable aircraft conceived by the foresight of the United States Air Force.

*Excellence in Electronics*

RAYTHEON

**RAYTHEON MANUFACTURING COMPANY**

**WALTHAM 54, MASSACHUSETTS**

# VERSATILE 2ø SERVOS

**SIZES 10, 11, 15, 18 • ONLY SIZE 10 IS ILLUSTRATED**

Oster®

- Can be wound for high or low impedances.
- Designed for use with transistorized or vacuum tube servo amplifiers.
- Control phase can be center tapped.
- Maximum torque-to-inertia ratio provided by minimum air gap construction.
- .43 gm.–cm.$^2$ rotor inertia. (For illustrated unit only.)
- –65°C to +150°C ambient temperature range. No warm-up required at low temperature.
- Sizes 10 and 11 available with 2 or 6 pole windings.
- Sizes 15 and 18 available with 2, 4 or 8 pole windings.
- Servo can be wound to operate on any specified voltage between 18 and 300 volts.
- Most sizes available in 400 or 60 cycle input voltage.

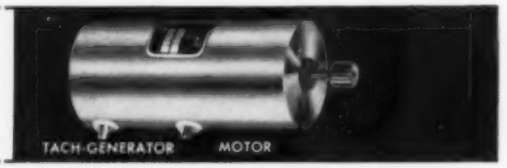
## SERVO with Exclusive INSTANT-STOPPING DC BRAKE

- .02 sec. stopping time without external loading.
- 12,000 radians per sec.$^2$ theoretical acceleration.
- 1.8 gm.–cm.$^2$ rotor inertia. (For illustrated unit only.)
- 1000 hours life at 75°C; 100 hours at 125°C.
- 27 volt DC brake excitation.

## SERVO-GEAR-TRAIN

- Precision gear train, 30 min. max. backlash.
- 1:1 to 4000:1 gear ratios. Higher ratios on special order.
- *Exclusive* DC brake may be added.
- 25 in.–oz. max. operating load torque. 75 in.–oz. max. momentary load torque will not damage gear-train.

## SERVO-TACH-GENERATOR

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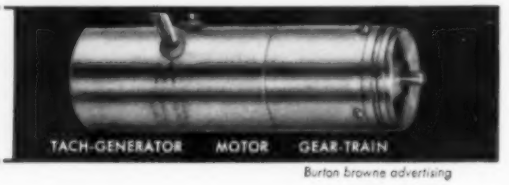


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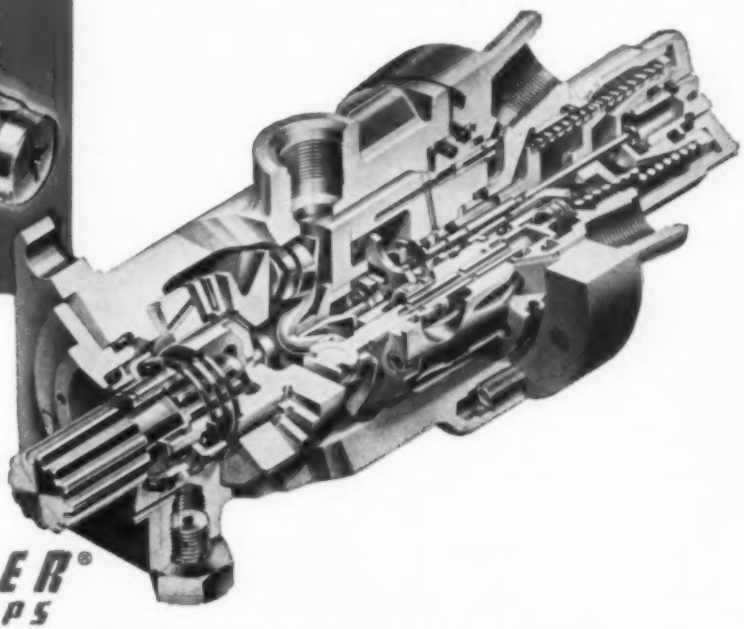

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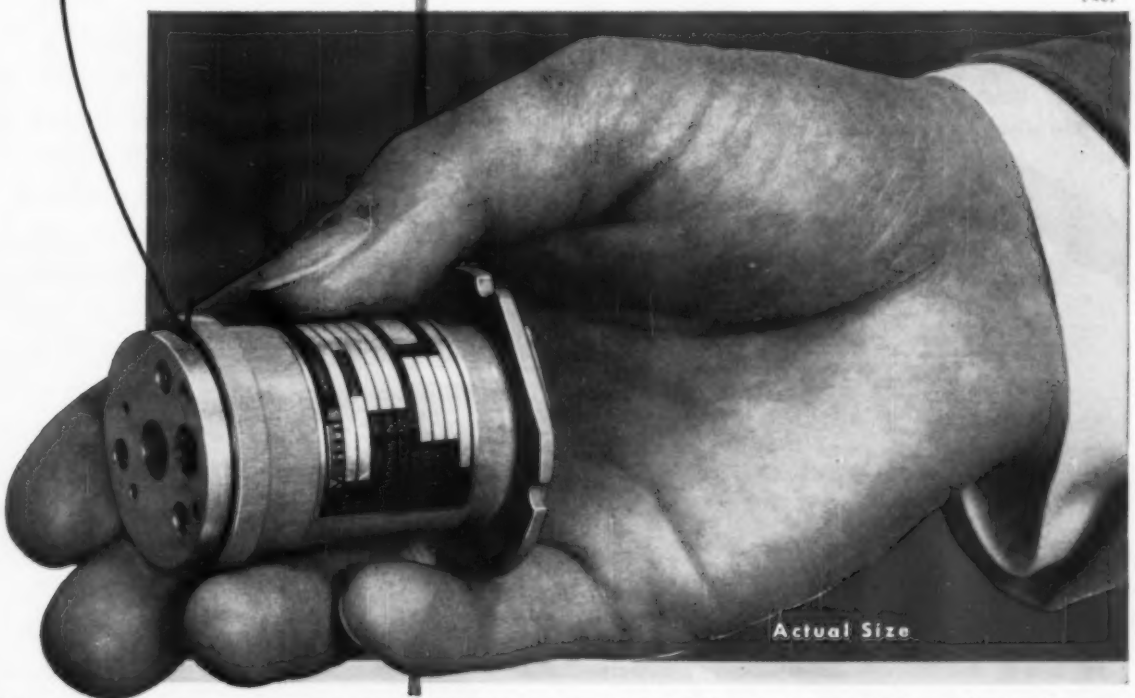


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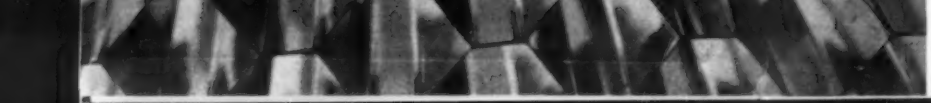

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# AVIATION WEEK

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**COVER:** Douglas RB-66s are being delivered to the USAF for its Tactical Air Command. B-66 bombers also are going into service with combat units. The Douglas light-bomber is equipped with Allison J71-A-11 engines. A3Ds, the Navy version, is being delivered direct from factory to fleet units (see p. 28).

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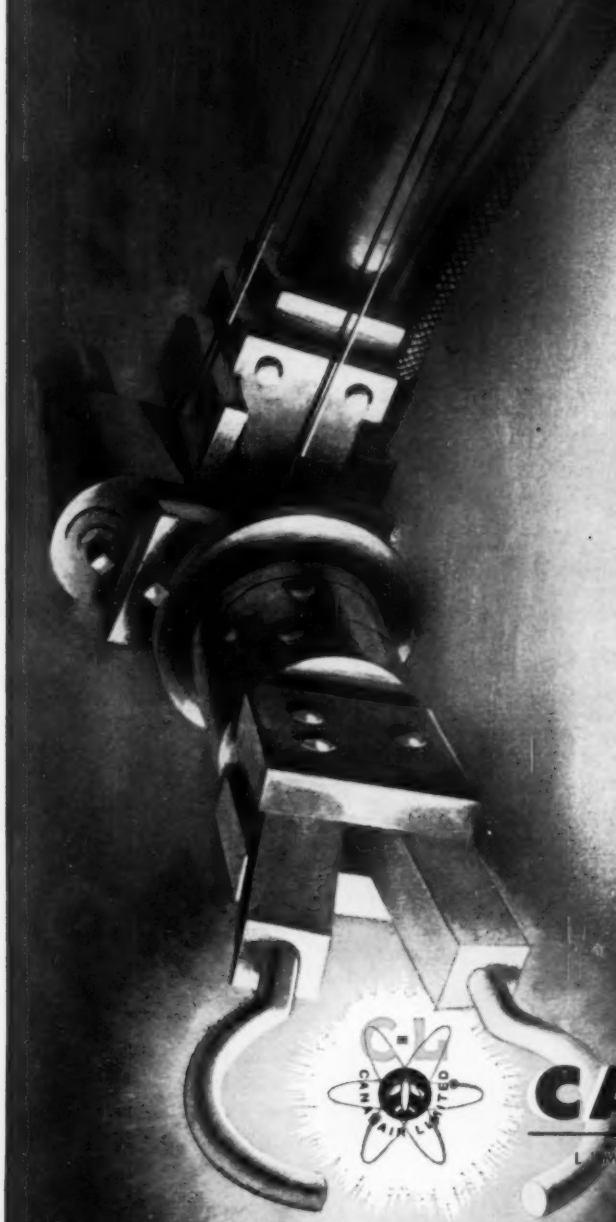
# ASSIGNMENT ATOM



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# EDITORIAL

## Where Are We Going?

Where are we going? In the midst of the white-hot political debate over whether this country shall continue its policy of maintaining superior airpower or settle for a balanced budget and second-rate Air Force, it is a relief to take a broad, comprehensive look at the purely technical aspects of the airpower industry and try to discern, however dimly, just where we are going.

There never has been, and may never be, an industry that can match the technological pace of the aircraft industry in its brief 53-year growth from the days of the Dayton bicycle shop. Particularly when allied with its post-war partners, the nuclear and avionics industries, aviation development has been galloping along with giant strides. It is this unprecedented technological development pace that makes it so difficult for men experienced in older, slower and more-conservative industries to successfully manage public responsibilities that encompass the technical wild horses of aviation, atomic energy and electronics. All of these technologies have matured only in the past 15 years, and their basic nature is totally foreign to older industrial captains brought up in the tradition of steam turbines, long-line power transmission and automobile manufacturing.

Although the aircraft industry is approaching sufficient maturity to see the passing of many of its pioneers, including Glenn L. Martin, Frederick Brant Rentschler, Andre Preister and Ralph Damon, it still is young enough to have leaders who are now successfully riding the tide of the jet age and can remember beginning their careers in the spruce, doped-canvas-and-baling-wire era.

### Growing Science of Human Factors

However, the progress of the first 53 years that has brought us from the first brief flights off the sand at Kitty Hawk to the empty fringe of outer space hurtling man at 1,650 mph. at altitudes above 90,000 ft., makes it evident that even this amazing span of progress will pale before the achievements of the next decade when man will make his first excursions into space and be armed with aerial weapons that still stagger the imagination. The only consistent trend among prophets of airpower is that they have all been proved outrageously conservative by the actual technological progress in this field.

Major changes are in store for the role of man in aviation. On the ground, the constantly-growing demand for more and better technicians, extending from the people who maintain and service aircraft, missiles and space vehicles to the scientists and engineers who create them, will require a vastly-higher level of technical education.

In the air, the role of man is already changing from wrestling—often by brute force alone—the vehicle through the atmosphere to that of a monitor, safety valve or thinking machine presiding over an automatic or semi-automatic aerial vehicular system.

The growing science of human factors that is working hard to better fit man into the unnatural environments into which flight is taking him is already well into the problems of cosmic radiation and zero gravity that must be solved before pushing man into outer space. In the commercial field, the Mach. 2 fighter of today slicing through the thin stratosphere on razor-thin wings and fins will be found scaled up to transport size bearing more than 100 passengers across the Atlantic in less than two hours and shrinking the Pacific to a fraction of a day's flight.

### Technical Horizons

The propulsion systems of today will seem crude and tiny compared with the tremendous powerplants that loom for tomorrow, ones unleashing high energy fuels, nuclear power and solar energy.

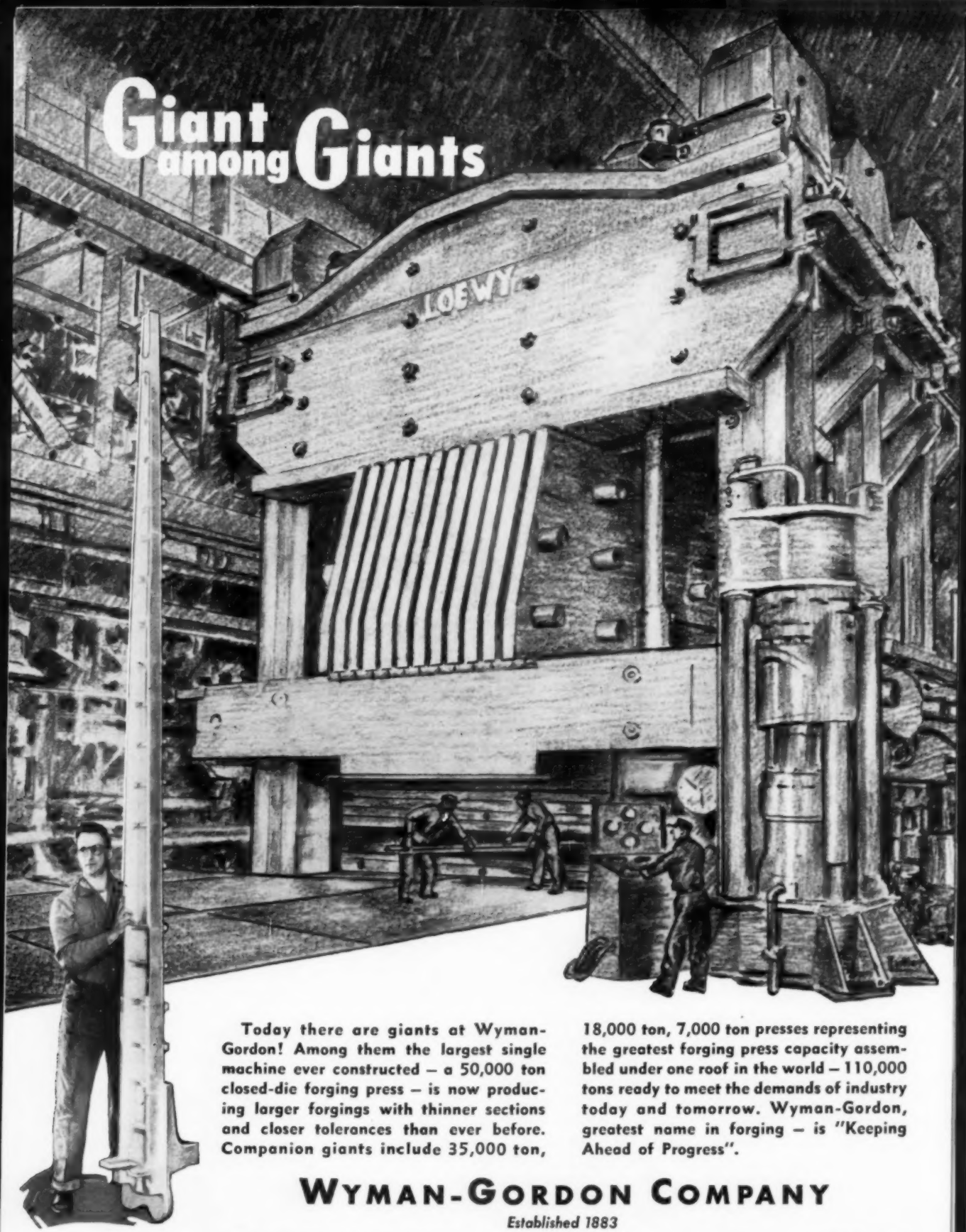
Military aerial weapons now flying at twice the speed of sound are nudging into the hypersonic range with maximum speeds of 15,000 mph., carrying area-obliterating warheads around a quarter of the globe in 30 minutes. The development of these weapons already is spawning a whole new field of industrial development.

After the first probing finger of rocket-powered missiles shatter the silence of outer space, there will come earth satellites extracting secrets of this unknown void and, finally, the manned space ships bursting man out of his atmospheric environment.

For those of us in this fascinating field who become weary over public apathy or political perfidy and watch the Washington temperature rise from the heat of the airpower debate, take a good look over the broad spectrum of the technical future and take heart.

—Robert Hotz

# Giant among Giants

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# WHO'S WHERE

## In the Front Office

**A. H. Milward**, chief executive, British European Airways.

**Albert L. Varrieur**, general manager-Denver division, vice president, Martin Co., Baltimore, Md. Also: Herman Pusin, chief engineer, engineering division, and **C. N. Castle**, manager-project design department.

**Edward L. Ladd**, president, United Aircraft Products, Inc., Dayton, Ohio. He succeeds the late **John M. Meyers.**

**George N. Saum**, vice president, George Fry & Associates, Chicago, Ill.

**George H. Miehls**, president (re-elected) and board chairman, and **Sheldon Marston**, executive vice president, Albert Kahn Associated Architects and Engineers, Inc., Detroit, Mich. Also, **G. S. Whittaker**, a director, to succeed the late **O. L. Canfield.**

## Honors and Elections

**Dr. Galen B. Schubauer**, Chief of Fluid Mechanics Section of Mechanics Division of National Bureau of Standards, has been awarded the Department of Commerce Gold Medal for Exceptional Service, recognizing his "outstanding contributions to basic aerodynamics over the past 20 years."

**Robert Granville Stone**, Chief, Technical Information and Publications, Hq., USAF Air Weather Service received the American Meteorological Society's award for outstanding services to the Society by an individual. He was honored "for his many years of faithful editorship of the Bulletin of the American Meteorological Society and his active participation in committee and council work."

**Col. Horace A. Hanes**, USAF, has been awarded the De La Vaulx Medal by the Federation Aeronautique International for setting a new world speed record of 822.266 mph. over an 18-km. course in a North American F-100C Super Sabre Aug. 20, 1955 (since broken by Britain's Peter Twiss flying the Fairey F.D.2 delta research plane at approximately 1,132 mph.).

**Robert A. Wolf**, systems research engineer, Cornell Aeronautical Laboratory, Buffalo, N. Y., has been named a member of the Jet Pioneers Association of America for his recommendations to National Advisory Committee for Aeronautics that led to the concept of the series of "X" research airplanes and contributions.

## Changes

**Dr. Theodore Theodorsen**, chief of newly formed Scientific Research Staff, Republic Aviation Corp., Farmingdale, N. Y.

**Dr. David B. Langmuir**, Electronic Research Laboratory director, Ramo-Wooldridge Corp., Los Angeles, Calif.

**Enar B. Olson**, director of administration, Northwest Orient Airlines.

**Burton W. Beers**, assistant head-flight operations department, Guided Missile Laboratories, Hughes Aircraft Co., Culver City, Calif.

# INDUSTRY OBSERVER

*This week's Industry Observer column is composed of items from the 12th Annual Forum of the American Helicopter Society.*

► Top level reconsideration is being given to Army's recent decision to cancel the H-16 development contract with Vertol Aircraft Corp. An *ad hoc* committee at the Pentagon is studying performance data on a proposed version powered by Allison T-56 turbine engines. Friends of the project charge that the contract was canceled on the basis of incorrect figures.

**► Parsons Aircraft Corp., Traverse City, Mich., will soon deliver a set of all-weather blades for the Vertol H-21 helicopter. They were developed by Parsons as a company project with no contract. WADC has a contract with another manufacturer for all-weather blades and Vertol is working on its own version.**

► Army is evaluating first two of its new Aircraft Mobile Maintenance Vans. Following shakedown at Transportation Corps Research & Development Command, Ft. Eustis, Va., they will be tested under field conditions in Europe. Army has ordered 18 units.

**► Army Aviation School at Ft. Rucker, Ala., has given helicopter instrument certificates to 13 pilots. Army says instrument flight now is fully feasible and its cargo pilots will be trained in instrument work.**

► USAF's Office of Scientific Research, headed by helicopter pioneer Brig. Gen. Frank Gregory, will move from ARDC headquarters in Baltimore on July 1. New home of OSR: a renovated building on Constitution Avenue in Washington.

**► Navy experiments with helicopters as tugs will not be confined to anti-submarine-warfare applications. A new idea is to use them to tow jet-propelled seaplanes, which have inherently-poor handling characteristics on the water, poor power for taxiing. The helicopter tug can be used to get the seaplane into takeoff position, tow it to moorings after landings. Tandem design is considered best for towing operations. Future towing helicopters also must be built to permit steady operation at 45-degree, nose-down attitude to permit 360-degree visibility for pilots.**

► First Bell XV-3 convertiplane now has about two hours of hovering and low speed helicopter flight time. Three pilots have checked out. Fact that a large part of wing area is in the hovering downwash has not presented a major problem. Ratio of components under the rotor disk to total disk area is about 9%. This makes hovering download about 6% of gross, only slightly higher than the figure for many helicopters. NACA has unpublished test results on this problem, which is common to some other configurations now undergoing tests, particularly the Sikorsky twin-engine S-56.

**► Major helicopter bugaboo remains in design of rotor blades and hubs, which present maintenance and operational problems of importance to military services. Bell Aircraft is pushing experiments to improve design, recommends more research on rotor configuration by entire industry. Some manufacturers feel that investment in this field may pay off by overcoming strong trend toward STOL in effort to get away from rotors.**

► Piasecki Aircraft Corp. is making a very strong bid to get the overhaul contract for the blades on Army's H-25 helicopters, manufactured by Vertol Aircraft Corp.

**► Vertol Aircraft Corp., is calling upon its engineering department to step-up research and development activities. The company is expected to build a wind tunnel and to install other new R & D facilities. Meanwhile, there is a strong possibility that the program to win CAA certification for the turbine-powered H-21 will be renewed.**

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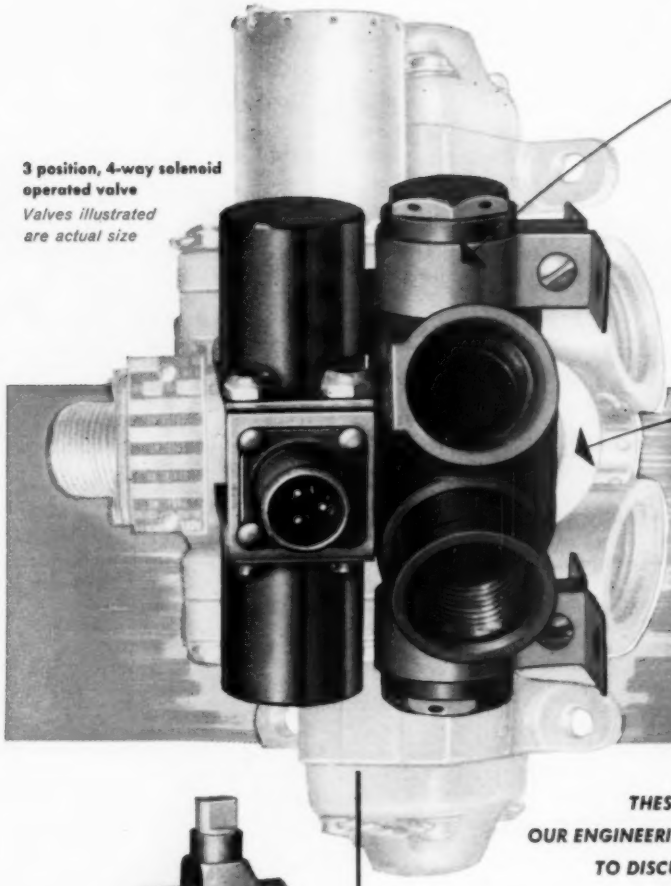

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**2 position, 3-way solenoid operated selector valve**

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# WASHINGTON ROUNDUP

## Murphree's Power

The power of Eger Murphree, sometimes called the "czar" of the guided-missiles programs, will stem from "knowledge rather than authority," Secretary of Defense Charles Wilson reports. He told senators that Murphree will know the facts and know what should be done—and that is what will be done.

## Minetti-Lowen Before Senate

Approval of the nomination of New Yorker F. Joseph Minetti to fill a Democratic position on the Civil Aeronautics Board and Charles J. Lowen as administrator of the Civil Aeronautics Administration are expected at the next executive meeting of the Senate Commerce Committee on May 23. At hearings last week, it was developed that both Senators from New York—Herbert Lehman (D.) and Irving Ives (R.)—as well as the Democratic governor of New York, Averill Harriman, favor Minetti's appointment. Also, that both senators from Colorado—Gordon Allott (R.) and Eugene Millikin (R.)—favor Lowen's appointment. Probably more important, though, is the strong letter of indorsement of Lowen by Colorado's Democratic Edwin Johnson, former chairman of the Senate Commerce Committee.

## USAF Contract Cuts

The Fiscal 1957 USAF budget is based on the presumption that $1.1 billion will be recaptured from outstanding contracts—through price reductions and cancelations. This amount already has been earmarked for other programs. If it develops that USAF doesn't recapture the money an additional $1.1 billion appropriations will have to be made to carry out planned programs.

## Industry Pressure

Secretary of Defense Charles E. Wilson has reported to House and Senate Appropriations Committees on aircraft industry resistance to cutbacks in lead time—which lower the contracts outstanding and business backlogs.

This comment to the House group: "There will always be a pressure from the manufacturers to get orders as far out ahead as they can get them, and they have a pretty good crowd of people working here in Washington keeping their business going."

## Russian Refueling

Despite Russia's failure to parade growing air might in its May Day flyover this year, some observers expect reports of further Soviet advances. Best bet, and one that will add fuel to current Defense Department fires: Public demonstration of Red Air Force's air-to-air refueling capability.

## Procurement Investigation

Pleased with the results of its staff's investigation of USAF and Navy aircraft procurement policies and practices (AW Mar. 26, p. 26), House Appropriations Committee has decided to continue the investigation another year. Some of the criticisms which investigators will follow up on are: Misuse of research and development funds for production; too much delay in setting firm target prices on incentive-type contracts; delays in firming up letters of contract.

## Campbell Criticizes CAB

Comptroller General Joseph Campbell has taken the Civil Aeronautics Board to task for failing to force airlines to comply with prescribed accounting practices. In testimony before a House Anti-Trust Subcommittee, Campbell cited one case in which capital items were charged to expense, resulting in an inflation of the airline's operating expenses. In one instance, he said, modification costs of engines were charged to operating expense instead of capital accounts. He explained that the conversion of engines to greater horsepower than at the time of acquisition is an improvement or betterment of an asset.

"Correspondence and discussions between the Board staff and the carrier in question failed to have any remedial effect, and the carrier has declined to correct its practices," Campbell said. Under these circumstances, he said, economic regulations are circumvented, thus weakening the CAB's position as a regulatory body.

## Expensive Electronics

USAF is rapidly becoming more worried about the unreliability of electronic components in weapon systems. In addition to the peril of malfunction, which could completely abort defensive or offensive air missions, there is the matter of cost. According to Maj. Gen. David H. Baker, Air Materiel Command's procurement chief, the cost of maintaining unreliable electronic equipment is fast becoming unacceptable. The general made a survey of electronic systems in use. He made this staggering finding: Costs in the initial year for maintenance of electronic gear is twice the original cost of the equipment. Maintenance cost for the rest of the useful life ranges from 10 to 100 times the original cost.

## Once Bitten

Defense Secretary Wilson has become shy on the subject of dogs, even though he expresses his regard for horses quite openly. When it was suggested at a recent House committee hearing that the Army could use cavalry in places like Korea, Wilson said: "I like horses, too, you know."

There followed this exchange:

**Mr. Flood:** Let us reactivate Ft. Riley and put some regimental combat teams of horse cavalry into the field in case we need them. . . .

**Mr. Miller:** Of course, the Army dog is more of a weapon today, I think, than the horse.

**Secretary Wilson:** Off the record.

(Discussion off the record.)

## Defense Secretary

The House Information Subcommittee, headed by Rep. John E. Moss (D.-Calif.), now plans to quiz Defense Department officials sometime in June. The subcommittee is exploring policies of executive and independent agencies with regard to releasing or withholding information from the public and Congress. Close attention will be given to (1) political "censorship" of defense news and (2) unnecessary secrecy which holds back technological development.

—Washington staff.

# Administration Hits Airpower Opponents

**Stung by criticism of its defense program, administration bolsters role of Navy air, points to B-47s.**

By Claude O. Witze

Washington—The Eisenhower Administration sprang to the defense of its "budget-wise" airpower program last week, replying to "fear-mongers"—presumably including Gen. Curtis E. LeMay—who have warned that Russia is overtaking U. S. leadership in technology and strategic-bombing capability. In an apparently carefully-coordinated attack, the administration countered with these arguments:

• **Our B-47** medium jet-bomber wings are "the most powerful single element of airpower in the world."

• **The U. S. Navy** is the most powerful in the world, with 15 carriers. The carriers were described as having a "strategic capability" that adds to "our retaliatory striking power."

Both President Eisenhower and Defense Secretary Charles E. Wilson spoke out, with particular emphasis upon the Navy's air arm. It was Wilson who used the "fear-monger" label in testimony before a Senate Appropriations Subcommittee.

### No Policy Change

Despite the administration's emphasis on the Navy air arm, it was clear there has been no basic change in military policy or doctrine. In response to a query by AVIATION WEEK, the Defense Department denied there has been any alteration or amendment to the 1952 Memorandum of Understanding which defines the roles and missions of the armed forces. Under the terms of the memorandum, the Navy has no strategic air mission.

Administration leaders clearly were replying to the testimony of Gen. LeMay, Commander of the Strategic Air Command, before the Senate Armed Services Subcommittee headed by Sen. Stuart Symington (D.-Mo.) (AW May 7, p. 28).

Earlier public warnings had been made by Gen. Nathan Twining, USAF Chief of Staff; Gen. Thomas D. White, Vice Chief of Staff, and Trevor Gardner, former Assistant Secretary of the Air Force for Research & Development.

Defending the administration's "austere" budget, Wilson also disclosed that production of long-range B-52 jet bombers is scheduled to hit a peak of 20 a month (presumably sometime in Fiscal 1958) from the present rate of six.

Gen. LeMay has pointed out that Russia is building the comparable Bison bomber at a rate substantially higher than our output of B-52s.

Both the President and Wilson suggested that LeMay's testimony concerned itself too much, in their view, with the Strategic Air Command and the B-52. Mr. Eisenhower warned against looking at one particular phase or part of an organization when we begin to compare our position with others.

Wilson spoke of "proponents" of particular phases of the overall program, who, he said, tend to oversell their own activities.

### Wilson Scores Critics

Wilson denied flatly the assertion of his civilian, congressional and military critics that Russia is outstripping the United States in airpower.

It was obvious in the capital that the administration is fighting to uphold its budget program in the face of political threats in an election year. Some observers attached significance to these other items in the news:

• **Plans for a record-setting** airpower parade over Washington on Armed Forces Day. Weather permitting, the USAF will fly 216 B-47 jets over the capital, along with more than 50 aircraft of other types. It will be the first Air Force flyby of this magnitude, and apparently was designed to bolster confidence in U. S. airpower.

• **Publicized prediction** by Harold E. Stassen, the White House disarmament adviser, that Russia plans a spectacular arms-cut announcement, and will challenge the United States to follow its lead.

• **New assurances** from Secretary of State John Foster Dulles that there are strong hopes for peace in the Middle East. He said Russia "seems increasingly aware of the dangerous consequence of reckless action."

### Pentagon Reaction

At the Pentagon, USAF observers were quick to jump on the Eisenhower-Wilson statement that the Navy's carriers are an important factor in the country's strategic air strength.

They said that, in the case of war, the fleet would be engaged entirely in its own defense against Russian air and undersea raiders during the initial stages.

The carrier-based planes, they said, never have figured in plans for retaliatory attack on enemy targets because the Navy will not, and cannot, schedule its roll in advance. The only targets the Navy is sure to hit, they said, are those which house some menace to the fleet.

In contrast to this, Wilson said the carriers are an important part of our security program "providing mobile bases for immediate retaliation against enemy attack." He made no mention of Russia's submarine fleet, which numbers well in excess of 400.

Wilson declared that the United States "is not and should not be com-

## House Approval a Wilson Victory

Washington—Approval of the administration's Fiscal 1957 airpower budget by the Democratic-controlled House Appropriations Committee is a major, but not decisive, victory for Secretary of Defense Charles Wilson.

When the committee acted, the Senate Armed Services Subcommittee, headed by Democratic Sen. Stuart Symington, of Missouri, had been able to publicly present only one facet of its case challenging the administration program—Gen. Curtis LeMay's testimony on intercontinental bombing capabilities.

Public sessions with two other field commanders are on the agenda of the Symington subcommittee: Gen. Earle Partridge, Commander of Air Defense Command, and Gen. Otto Weyland, Commander of Tactical Air Command.

Following in LeMay's footsteps, both are expected to present pictures of deficient forces. Both already have appeared in executive session.

The House Appropriations Committee, in determining the adequacy of the Air Force program, relied heavily upon the testimony of Secretary of the Air Force Donald Quarles and Chief of Staff Gen. Nathan Twining.

Meanwhile, executive testimony before the Symington group by LeMay, Partridge, and Weyland is being edited for public release. The next USAF witnesses scheduled for executive sessions are Lt. Gen. Emmett O'Donnell, Jr., Deputy Chief of Staff for Personnel; Maj. Gen. L. B. Washbourne; Assistant Chief of Staff for Installations; Lt. Gen. C. S. Irvine, Deputy Chief of Staff for Materiel.

peting in an all-out armaments race with the USSR." This was matched by the President, who said we have no intention of trying to match Russian strength in long-range bombers.

To this, Sen. Walter F. George (D.-Ga.) replied in a statement that "it will be disturbing to the country to be constantly reminded that the Russians are building up an enormous air force but that we are not keeping pace."

Another figure cited by Wilson was what he described as the active inventory of USAF for 1957.

The number: 25,000. This clearly includes aircraft in the Air National Guard, Reserve and all of USAF's noncombatant planes. Gen. Twining already has testified that the Russian air force has approximately 20,000 combat aircraft, thousands more than USAF.

Wilson also feels there has been "considerable misunderstanding" about the Defense Department's research and development efforts. This was interpreted as a reference to testimony and two magazine articles by Trevor Gardner critical of the red tape involved in the U. S. research-and-development program.

In addition, Lt. Gen. Donald Putt, USAF Deputy Chief of Staff for Development, has urged a $150 to $200 million increase in the R&D budget.

To this, Wilson replied that the research and development program will draw funds from other sources to boost the amount available in Fiscal 1957 from the listed $1.6 billion up to $5.2 billion. He said the Defense Department will give Congress a statement proving these figures are correct.

# House Group Approves Airpower Plan

By Katherine Johnsen

**Washington**—The powerful House Appropriations Committee has decided to "go along" with the administration's air-power program despite its "concern" over the growing strategic-air capability of the USSR.

In approving the USAF's Fiscal 1957 budget requests essentially as recommended by the administration, the committee said "the Air Force has made a strong case" for the program. In its report, however, the committee expressed doubt over the U. S. position in the air. The report said, in part:

"It has become evident that Soviet Russia is now a first class airpower with a rapidly developing offensive, as well as defense, capability. It has become evident that Soviet Russia will probably equal the U.S. in offensive airpower capability within a very few years unless the U. S. is to expand the overall size of its Air Force and substantially step up the production of aircraft.

### Air Power Dilemma

"The question to be resolved is what to do about it. Should we attempt to stay ahead of the Soviets in the overall size of our Air Force and in the numbers of aircraft to be produced or should we attempt to maintain what is determined to be a sufficient Air Force equipped with the best modern aircraft to act as a deterrent to any possible aggression?

"The current Air Force budget is based upon the latter determination."

The budget calls for procurement of 3,395 new naval and Air Force aircraft in Fiscal 1957—995 less than the 4,390 funded in Fiscal 1956. Here's how the total is divided:

- **Air Force:** 1,927, as compared with 2,777 in Fiscal 1956.
- **Naval aviation:** 1,468, as compared with 1,613 in Fiscal 1956.

The USAF Fiscal 1957 procurement includes 202 B-52s. W. J. McNeil, Assistant Secretary of Defense (comptroller), reported that this is 29 more than originally requested by the USAF Air Staff. He said the Air Staff originally asked for 190.

McNeil said that, after a one-month cut in lead time in the placing of contracts to keep production flowing, it was decided to fund 173 of these B-52s with Fiscal 1957 funds and the remainder with Fiscal 1958 funds.

The review which resulted in a $248 million supplemental request for the B-52 program in mid-April, McNeil said, provides for 29 more aircraft. It includes $230 million for aircraft orders and $18.5 million for expansion of production facilities.

Secretary of Defense Charles E. Wilson, in discussing the dissatisfaction expressed by Gen. Curtis LeMay, commander of the Strategic Air Command, over the current B-52 program, told the House Appropriations Committee:

"If you left it up to Gen. LeMay, you would spend a great deal more for these B-52s, and we would have about four plants making them, instead of two. He would not bother with very many fighters. That would be his slant on it."

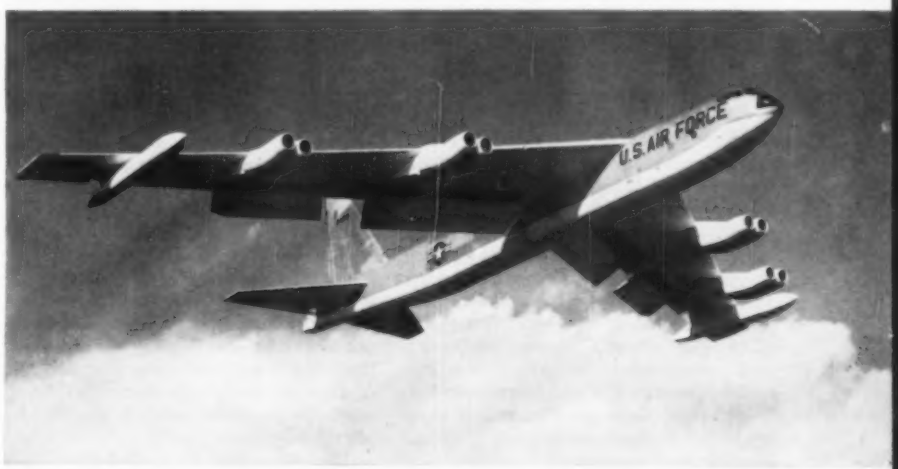
Wilson gave major credit for the increase in the B-52 program to Adm. Arthur Radford, chairman of the Joint Chiefs of Staff.

"The admiral," he said, "has been telling me right along that he would like to see more B-52s built if we could do it," Wilson told House Appropriations Committee.

### Budget Approvals

The total Fiscal 1957 budgets—in new money—approved by the committee were:

- **Air Force:** $15.5 billion, $187 million less than requested, but $738 million more than new money provided in Fiscal 1956.
- **Naval aviation:** $2.5 billion, $2 mil-




## B-52C Carries Larger External Tanks

**The 400,000-lb. B-52C flies a test near the Boeing plant at Seattle, Wash., where it is produced. The photograph, the first of the model to be released by the Department of Defense, shows clearly the larger external tanks which differentiate the model from earlier B-52s. The eight engines are Pratt & Whitney J57s.**

## New Navy Planes Delivered

**Douglas Aircraft's El Segundo Division last week delivered an A3D Skywarrior (left) and an F4D Skyray from the factory to COMMAIRPAC at San Diego. The A3D, heaviest attack bomber now designed for operation from Forrestal class carriers, was assigned to HATRON (Heavy Attack Squadron) Two. The F-4D will start its service at North Island Naval Air Test, San Diego.**

lion less than requested, but $728 million more than Fiscal 1956.

Funds for procurement and research were approved as recommended. These will provide for:

• **USAF aircraft** and related procurement: $7.64 billion, slightly less than the $7.63 billion program for Fiscal 1956.

• **Naval aircraft** and related procurement: $2 billion, slightly less than the $2.09 billion program for Fiscal 1956.

• **USAF research and development:** $611 million, slightly higher than the $607 million Fiscal 1956 program.

• **Naval aviation research** and development: $181.6 million, as compared with the $186.4 million Fiscal 1956 program.

### House Recommendations

Key recommendations made by House Appropriations:

• **Defense Department** should make a study with a view towards expediting the introduction of new weapons—particularly guided missiles and electronics. "It was testified that the development and introduction into our arsenal of the latest and more effective weapons is being effected as rapidly as advances in technological sciences permit, but a number of members of the committee express considerable doubt that the introduction is being effected as rapidly as possible."

• **An "immediate and bold"** approach must be taken to expand the training of scientific and engineering personnel. The committee suggested an integrated program between the Air Force and other government agencies requiring such personnel. The committee also called upon the Defense Department to take the lead in the matter and, if legislation is required, to promptly recommend it to Congress.

• **Air Force should adopt** the Navy program requiring personnel receiving specialized training to sign up for additional service. "The Air Force, with a very large training program and with perhaps the greatest need for retaining personnel trained in the technological field, does not require trainees to obligate themselves to continued service for the privilege of obtaining specialized technological training."

• **The Office of the Secretary of Defense** should concentrate on following up on the implementation of major procurement-policy orders and reduce or eliminate the effort that is now going into "minutely detailed instructions, apparently prepared in a vacuum in Washington."

• **"The shortcomings and weaknesses,** including a lack of inter-service cooperation" disclosed in the Army-USAF exercise Sagebrush last fall (AW Dec. 5, p. 14) should be corrected.

• **USAF was requested to submit** a "firm" plan to the committee by next January for establishing the Military Air Transport Service as an independent operation on a revolving fund basis. Operating costs for MATS during Fiscal 1955 were estimated at $560 million. For Fiscal 1957, the committee cut $15 million from the USAF budget, reducing MATS operating funds and declared: "The Air Force should give attention to handling its air transport business in such a way as to assist in keeping the non-scheduled and other airlines in a reasonably sound financial and operating position."

### Army Budget Approved

The committee enthusiastically approved the Army's Fiscal 1957 research and development and procurement programs placing major emphasis on guided missiles and electronics, commenting that "there is the feeling that in light of recent world developments even more pronounced stress" should be placed.

The Army has earmarked $113 million for guided-missile research and development during Fiscal 1957, as compared with only $13 million for aircraft. Of the Army's $1.4 billion procurement program, $809 million is earmarked for guided missile procurement.

## Century Fighters Need Specialists As Pilots

**Los Angeles**—Pilots who will fly the F-104 and other Century series planes should be specialists, since the high speed and characteristics of these aircraft as weapon systems demand so much training and concentration, A. W. LeVier, Lockheed's director of flying operations, said recently.

Additional details on Lockheed's F-104A Starfighter also were revealed by LeVier at a graduation of 52 USAF and Navy officers from a flying safety course at University of Southern California.

• **The F-104** will fly the pattern at the same speeds (200 kts) as current fighter types.

• **Its gliding ratio** clean configuration, (lighter weights) of 10 to 1.

• **The landing gear system** is such that in deadstick landings, the pilot can fly to the flareout point and then drop the gear which will lock in four seconds.

• **Fuel management** is automatic. If external fuel is carried, the pilot need throw only one switch and then can forget about sequencing or management problems which take much attention.

• **With the downward ejection seat** at low altitudes, the airplane is simply rolled onto its back and ejection carried out upwards.

• **The plane will operate** off 6,000 ft. paved strips.

• **Two complete control systems** are carried, plus a third which operates off emergency pump powered by engine windmilling alone.

• **The instrument panel** is the simplest yet devised for this type of airplane.

• **The airplane can land** as slow as 130 kts., IAS, at light weights.

The new ejection seat under design by Lockheed, LeVier said, will be sufficient to insure pilot survival at any speed the F-104 can fly (Mach 2 or better). Lockheed has an improved version of the MC-1 partial pressure suit.

# Trans-Canada Buys British Jets To Power American-Built Planes

**New York**—First firm order for British jet engines to power American-built jet airliners was placed last week by Trans-Canada Airlines. Other orders for British engines are anticipated, creating a real challenge to American engine manufacturers, particularly Pratt & Whitney Aircraft.

TCA purchased four Douglas DC-8 airliners to be fitted with Rolls-Royce Conway by-pass engines. Another two DC-8s are on option and G. R. McGregor, TCA president, says that the airline will require eight in all during the period 1960 to 1965.

McGregor said TCA took the first plunge with the Conway engine in full confidence that some other airlines would follow suit. He mentioned BOAC, Canadian Pacific Airlines, Air India International and Qantas as potential buyers of American jetliners with Conway engines.

CPA already has indicated it will follow TCA's lead so that Canada can simplify maintenance by using one type long-range jet airliner.

In London there was a report that Air France was contemplating ordering Bristol Olympus engines (see below). It was not clear whether these were for the Sncase 210 Caravelles or for additional Boeing 707-320s, which Air France has on option. Its firm order for ten 707s specifies the Pratt & Whitney JT4A-3 engine, the commercial version of the J75.

On the West Coast, there was a report from airframe manufacturing sources that airline officials were taking a new look at the Olympus. They said the Bristol engine comes closer to answering their jet transport needs than either the Conway or the J75.

Lower weight, better specific fuel consumption and lower noise level were listed by McGregor as reasons TCA selected the Conway engine over the Pratt & Whitney engines. All previous Douglas and Boeing jet orders had specified either the Pratt & Whitney J57 or J75). McGregor said the Conway was 1,200 lb. lighter-in-weight, had slightly better specifics, and had a noise level 12 decibels less than the PWA competitor.

With spares, TCA's Douglas purchase comes to $28 million. Deliveries will be made early in 1960 and the aircraft will be placed on transatlantic and transcontinental service later that year.

Trans Canada's other major equipment investment is $37 million for 36 Vickers Viscounts, eleven of which are now in use on its routes.

The airline also is in the market for a medium haul transport to fill in between its DC-8s and Viscounts during the 1960-65 period. McGregor does not think the Convair Skylark 600 will fill TCA's requirement. He considers it too close in size to the DC-8 and 707.

Under consideration are the Douglas DC-9, a light-weight development of the DC-8, the Lockheed Electra and the Vickers Vanguard. He is uncertain about the relative merits of the medium-sized turbojet and turboprop. TCA also expects Boeing will make a medium haul airliner proposal soon. McGregor says, "That market will be larger than the heavy jet market."

TCA's DC-8 purchase was announced on the 15th Anniversary of its service between Canada and New York City. On May 10, 1941, Trans-Canada began serving New York using Lockheed Lodestars.

## Hughes Buying Skylarks, More 707s

Howard Hughes is increasing his order for Boeing 707 jet transports and also will buy Convair Skylarks for Trans-World Airlines.

Hughes' original order was for eight 707-120s, with deliveries to start in April, 1959. Now, he has ordered one more Boeing 707-120 with J57 turbojet engines and 18 707-320 Intercontinental jet transports using the Pratt & Whitney J75 engine.

With this purchase, TWA will be equipped with nine of the smaller 707 jet transports for transcontinental service and 18 of the larger 320s for international routes.

Probably 20 to 25 Skylark 600s with the General Electric J79 engines will be included in the order to be placed with Convair. These are for intermediate-range flights.

# British Engines Seek Civil Orders

**London**—Bristol Aeroplane Co. Limited and Rolls-Royce Ltd. last week were locked in a battle for survival of their powerful Olympus and Conway jet engines—with one or the other facing a cutback in a Ministry of Supply economy drive. Both firms hoped forthcoming civil orders would save their program.

Conway has been without a home since the cancelation last fall of the Vickers V1000 jetliner, and the recent cancelation of the proposed Olympus-powered thin wing Javelin has been a severe blow to Bristol.

Trans-Canada Airlines ordered four Boeing 707s powered by Rolls Conway bypass engines.

Meanwhile, it was understood Air France has requested an option on 70 Bristol Olympus turbojets. This presumably would be for additional Boeing jetliners which the French airline planned to order. The Pratt & Whitney engine has been specified for the first ten Boeings on order by Air France, but the Olympus-powered version of Caravelle also has been under discussion. Bristol would not comment on the option report. The size of the Air France order is somewhat staggering—particularly if it indicates plans to purchase another fifteen Boeings. A fleet of 25 jetliners would set the French up as a severe North Atlantic competitor to other flag airlines.

Concern in both firms has been touched off by a secret Ministry of Supply meeting in which British defense officials flatly indicated one or the other of the two engines would be dropped in an economy move. This has resulted in what one American observer described as "a ding-dong battle for survival."

Although both Douglas and Boeing have indicated willingness to sell jet airframes with the British engine, Bristol and Rolls face American reluctance to start a modification program on the basis of any less than an order for 20 such aircraft.

The Ministry of Supply has given approval to Bristol to negotiate for the sale of its civil version of the Olympus to specified aircraft manufacturers and specific airlines.

The government decision partially removes the security handicap Bristol has faced in its campaign to sell the Olympus split-compressor turbojet for the DC-8 and the 707.

Despite Ministry of Supply agreement that Bristol now can sell Olympus, it still will not allow release of performance figures. Olympus 6 is reported to be operating on Bristol test stand at 16,000 lb. thrust. Development program calls for 19,000 lb. next year and 21,000 lb. by 1958.

Bristol undoubtedly hopes to have civil engines of approximately 20,000 lb. thrust available at about the same time as American jet transports become operational.

Commenting on the ministry approval of Olympus sales Sir W. Alec Coryton, chairman and managing director of Bristol Aero Engines, said, "Negotiations now in progress with air-

lines and aircraft constructors at home and overseas have already demonstrated that widespread interest exists and it is hoped that the first definite arrangements will be announced shortly." Presumably referring to Air France order, Coryton refused to comment on a report from a French source that Air France is ready to announce a sizable Olympus order. It also is apparent that an Olympus-powered 707 has been discussed with BOAC.

Bristol engineers recently visited Seattle to discuss installation of Olympus in both domestic and intercontinental versions of the Boeing jetliner. There also have been technical discussions with several of airlines which have Boeings on order. Highest announced thrust for military version of Olympus now in production is 12,000 lb.

## Proteus Flameouts May Set Back Britannia

**London**—Inflight flameouts of Bristol turboprop Proteus 705 engines may delay for a month the opening of BOAC Britannia service to South Africa originally scheduled for July. Bristol Aeroplane Co. has recommended to BOAC that no passengers be carried in Britannias until the problem is licked.

BOAC last week canceled its route proving trials with the Britannia while Bristol technicians went to work on the trouble. Flameouts are attributed to deicing. Slush sucked through intakes is believed to be extinguishing flame in combustion cans. Icing tests on the Proteus in England and Canada had not indicated such trouble.

The company was modifying the air intake system and the combustion cans. Tests were to start at Bristol last week on an engine with the new cans. An automatic re-light system was being installed which would immediately fire the engines again in event of a flameout. A fully modified aircraft was expected to be ready for a flight to Johannesburg this month.

## RCA Task Widens On Talos Contract

**Moorestown, N. J.**—Radio Corporation of America, prime contractor for the radar guidance and launching systems used with the Air Force land-based version of the Talos ground-to-air missile, has contracted to develop and build the complete weapon system installation, including architecture and buildings.

This was revealed at the recent dedication of RCA's expanded Missile and Surface Radar Department engineering facility here. RCA also is supplying parts of the guidance for the Navy shipboard version of Talos, developed under BuOrd sponsorship. (The missile is built by Bendix Aviation as prime contractor, with McDonnell Aircraft Co. fabricating the airframe and the Farnsworth Division of International Telephone and Telegraph Co. supplying the airborne guidance equipment. American Machine and Foundry Co., under subcontract to RCA, is producing the missile launching and handling equipment.)

The addition to the Moorestown facility raises total floor space from 145,000 sq. ft. to 264,000 sq. ft.

Although RCA does not identify the type of ground-based radar used for Talos guidance, there is a hint that it may be a relatively new type known as monopulse, which reportedly provides greater accuracy than the long-used conical scan type. RCA said that it developed a monopulse radar for guidance of the original Bumblebee missile, developed by Johns Hopkins University, out of which the present Talos developed.

(Unlike conical scan type radar, where the antenna dish or feed rotates to cause the radar beam to scan the target area to seek out the point of maximum signal return, monopulse radar employs two or four beams and simultaneously compares the relative signal return magnitude or phase to determine target location.)

**Grounded Comet I at Le Bourget**

**Two Air France Comet aircraft, including this one grounded at Le Bourget Airfield near Paris since March, 1954, have been taken back by the manufacturer. They and a shell of another were bought by the British Ministry of Supply for $1.5 million.**

### Hurley Denies Merger

**New York**—Rumors of a merger of Curtiss-Wright Corp. and the ailing Studebaker-Packard Corp. remained alive late last week despite denials by both parties. A statement by Curtiss-Wright chairman and president Roy T. Hurley implied that the path was still open. Hurley stated: "We have given careful consideration to the Studebaker-Packard situation. However, we have no plan for the merger of the companies." Official sources at the aircraft engine and equipment manufacturer flatly refused to elaborate on or attempt to interpret Mr. Hurley's statement or even refer to the discussions.

Earlier, another airframe builder, General Dynamics, had been connected with a possible merger with the automobile firm.

## PAA First Carrier To Install IBM 705

Pan American World Airways last week put to work its new International Business Machines Corp. 705 electronic data processing machine, the first to be used in the transportation industry and the fifth to go into service with any industry. The machine—there are more than 20 units to it—will handle the revenue accounting work initially.

Demonstrating the 705, which Pan American technicians installed for less than $100,000 and which rents for $30,000 a month, PAA Comptroller John S. Woodbridge said the machine will be operated by three employes instead of the 58 who handled the battery of older machines used in accounting. The 705 can process 8,000 tabulating machine cards a minute and handle in 125 hours the passenger revenue job now requiring more than 4,000 hours of machine time monthly.

The machine will be used to provide sales information on cargo operations, printing breakdowns by shipper, commodity, points of origin and destination. It will be used in inventory control, crew scheduling, analysis of aircraft operating data, and will provide many other kinds of information now available, if at all, only through complicated and costly research. Later it may be adapted to reservations control.

The IBM 705 takes its information from punched cards, translates it into impulses on magnetic tape (60,000 cards to the reel), feeds the tapes through a central processing unit with instructions stored in its magnetic memory core, and files the organized information on additional banks of tapes. The information then can be converted and run through a high-speed printer.

## Faulty Prop Indexing Blamed in C-54 Crash

Faulty maintenance work was blamed by the Civil Aeronautics Board for the crash of a Peninsular Air Transport C-54 at Seattle last November.

The accident occurred shortly after takeoff from Boeing Field on a Peninsular flight bound for Newark. A propeller malfunction produced too much drag for the airplane to handle, and the pilot crash-landed it in a built-up residential area.

Although no one was injured on the ground, 28 of the 74 persons aboard the C-54 were killed. The pilot and co-pilot survived.

In its report, the CAB found that the probable cause of the accident was excessively high drag resulting from improperly indexed propeller blades and inability to feather. The CAB said these conditions were the result of a series of maintenance errors and omissions.

Before the Peninsular flight took off, repair work was done on the propeller that was involved by Seattle Aircraft Repair, Inc.

The Board found that improper indexing of the propeller blades occurred during this work.

The report said:

"Poor maintenance procedures, omissions during maintenance and lack of proper inspection were evident in the maintenance work performed by Seattle Aircraft Repair, Inc."

The CAB found that the aircraft was not airworthy following the Seattle maintenance work.

## 'Deferred' Freight Service Begun by American, TWA

A new air freight service, slower than regular air freight yet faster than surface competition at comparable rates, has been inaugurated by American Airlines and TWA.

Called "Deferred Airfreight" by American and "Bargain-Air-Freight" by TWA, the service provides for delivery of freight on the fourth morning after its receipt at origin.

American will handle shipments on DC-7 flights between Los Angeles or San Francisco and New York, Chicago or Washington.

TWA will accept the low-rate freight for movement between Los Angeles or San Francisco and New York or Philadelphia.

A recent amendment of the minimum rate order for airfreight by the Civil Aeronautics Board allows reductions of 35% under normal charges on westbound "delayed" shipments and 45% on eastbound.

### First YH-31 Delivery to Army

**Doman Helicopters, Inc., Danbury, Conn., has delivered the first of two YH-31 helicopters to the U. S. Army for service tests by the Aviation Test Board in Fort Rucker, Ala. The YH-31, a utility helicopter, has a gross weight of 5,200 lb. and useful load of 1,950 lb. Capacity is eight persons. Fuselage of the YH-31 which is powered by a Lycoming SO-580-A1A engine, is designed so that the cabin doors open on both sides for seven feet to facilitate loading. The power unit can be removed in the field without hoists.**

# Army, Marines Seek New STOL

**Washington**—The aircraft industry will be asked within the near future to develop a short-takeoff Army and Marine Corps' observation plane that will fly at speeds of up to 300 knots for fast, safe penetration deep into enemy territory and then slow down to 100 knots for detailed observation.

The Navy will invite bids, acting for both the Marines and the Army.

Testimony by Maj. Gen. Hamilton H. Howze, chief of Army Aviation, before a House Appropriations Subcommittee recently revealed that:

• **The Army wants** a two-place observation plane "capable of landing and taking off from a 500-ft. field over a 50-ft. obstacle." The Army now uses the two-place Cessna L-19, which Gen. Howze said "takes too long to land." He said the L-19 "can operate in and out of a field 600-ft. long, except that is a little hairy."

• **The new observation plane** would have no armament and no armor except "perhaps . . . flak curtains."

• **Speed requirements** for the new plane give great consideration to safety of the pilot and observer. Gen. Howze said Army's Operations Research Organization has determined that a speed of about 300 knots is one of the best speeds for survival against ground fire and "additional speeds beyond that do give you an additional survival capability, but it moves up very marginally." He also said "the best protection against enemy aircraft is to get right down on the deck and slow down to 100 knots and go among the treetops."

Subcommittee members questioned him closely about speed. Gen. Howze said 300 knots "of course is not going to outrun the enemy fighters . . . it is not a question of our being able to outrun the enemy aircraft; we want to get there and back before he gets off the field." The L-19 cruises at 86 knots (about 100 mph.).

• **Although Gen. Howze** said the new aircraft might make penetrations into enemy territory of about 35 to 45 miles. With respect to "present aircraft under what might be called normal battle conditions", Gen. Howze said: "We would make only shallow penetrations in enemy territories, probably not over five or 10 miles." He pointed out that that figure had been exceeded, however, both during World War II and in Korea.

• **"The overwhelming chances** are we will use a conventional engine," Gen. Howze said. "By conventional I mean a prop-driven aircraft, but it may be turboprop as against a reciprocating engine."

The empty weight of the new observation plane apparently cannot exceed 5,000-lb.—the upper limit set on Army fixed-wing aircraft by the 1952 Memorandum of Understanding between the Army and the Air Force.

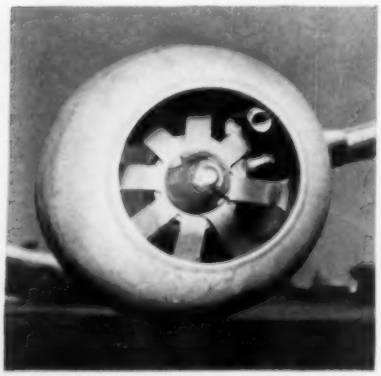
Four companies—North American Aviation, Inc., Cessna Aircraft Co., Fairchild Engine and Airplane Corp. and Hiller Helicopters, Inc.—already have done some preliminary design investigations for the Army and the Marines to determine the best speed-weight ratios.

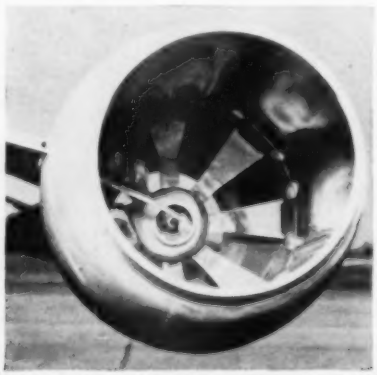
The four companies "will not have an inside track" in the awarding of development contracts, the spokesman said. All companies will be invited to bid.

**GYRODYNE XRON-1** Navy prototype has movable plates at tips of 13-ft coaxial rotors, that were kept under wraps except when craft flew. Gross weight is under 500 lb.; powerplant is a 40-hp. Nelson. Second prototype (right foreground) is partially disassembled.

**BELL 47J** utility is powered by a derated 220-hp. Lycoming engine. CAA certification is expected soon. It is built for Navy as HUL-1.

**HILLER HOE-1** Navy two-seater has starter for rotor tip ramjet engines located on right side of cabin.





**HILLER RAMJET,** igniter is shown at left; view from the rear details configuration of flameholders. Each rotor tip ramjet delivers 40-lb. thrust, enables the 544-lb. HOE-1 to lift nearly double its weight. Rotor head is at right.

**PRODUCTION SIKORSKY HR2S-1** changes from prototype: dual wheels on all landing gear legs, dual engine exhausts, large cooling-air grills on engine nacelles, extension of fairing behind rotor head. Horizontal tail is now one-piece and all-movable.

*At American Helicopter Society:*

# Pilot Training, Design Rules Criticized

**Washington**—Growing maturity of the helicopter industry, evidenced by a realistic discussion of technical problems involving both men and machines, highlighted this year's 12th annual forum of the American Helicopter Society.

Some observations on the state of the art made at the forum:

• **Maj. Gen. Hamilton H. Howze,** chief of Army aviation, said helicopters still are too expensive and too complex. They also need better stability, guidance and flight instrument systems.

• **Robert R. Lynn,** Bell Aircraft Corp., charged that military design and test specifications are unnecessarily tough on the designer and manufacturer. He said they create artificial problems and make no contribution to safety.

• **James S. Ricklefs,** Rick Helicopters, made a blunt argument for greater Federal subsidy to commercial operations, and charged that the Civil Aeronautics Board is holding back development. He urged that helicopter services be removed from their "experimental" status and given more than the current $3 million annually in Federal aid.

• **William H. Coffee,** Vertol Aircraft Corp., delivered an attack on pilot training procedures and pilot qualifications accepted by the military services. He called for establishment of a new "operational pilot" category for men capable of meeting all requirements in a rotary-wing cockpit.

Coffee, a veteran who has instructed more than 200 pilots already trained by the military services, charged that the services teach men to handle the aircraft but not how to operate them under realistic conditions.

Among the higher skills needed, he said, are the ability to fly at high gross weights, carry cargo in a sling, operate in confined areas and land on a slope. Coffee said he has flown with pilots who complained about the aircraft's performance, yet did not know the gross weight. Lack of this information, he said, would make it difficult to predict performance and prepare for marginal conditions.

Coffee also said helicopter pilot training is not being carried out to fit fliers for the operations they will face in the field.

An important factor in this, he said, is the failure to use flight handbooks. He suggested that written examinations should be required to force familiarization with their contents.

The perfect pilot, with 100% proficiency, is a human impossibility, Coffee believes. Maximum proficiency, he said, is about 90% and no pilot should perform operational work if he is less than 75% proficient. He believes a primary cause of the excessive military helicopter accident rate is the fact that many operational pilots are less than 60% proficient.

Lynn, a Bell engineer, said present military specifications require an excessive design load factor. This reduces the payload without necessarily increasing the ability of the aircraft to withstand severe maneuver loadings, he said.

He warned that maneuvers defined in the specifications sometimes bear no resemblance to regular helicopter flying and detract from the aircraft's safety by minimizing real problems such as fatigue.

Lynn said a Bell accident study showed that 72% of the mishaps to its Model 47 were due to pilot error. None were due to structural overload during maneuvers or violent handling of the controls.

About 14% of the accidents were blamed on material fatigue failure.

Lynn said there is no instance in Bell's record of an accident due to static overload.

In addition to fatigue, Lynn said more recognition should be given to the importance of the aerodynamic characteristics of rotors. He pointed out that the military requirement for a helicopter to be designed for an excessive load factor is not always positive insurance.

The reason is that such design does not make the aircraft sound if loading conditions exceed the capabilities of the rotor.

Gen. Howze told the forum that the Army's development of mobility is lagging behind the progress in firepower. He said the Army's interest in helicopters for missions utilizing their agility over short ranges has not lessened, despite recent enthusiasm for STOL aircraft.

He also predicted that the Army's tactical manuals will be rewritten to take helicopter troop movement into account.

# Second SeaMaster Begins Tests

**Baltimore**—Martin's second P6M four-jet SeaMaster began its long-delayed flight-test program last week almost five months to the day after the crash of the first prototype into the mouth of the Potomac River.

The tests began one day after a joint Martin-Navy announcement detailing the probable reasons behind the Dec. 7 crash and a statement that "corrective action has been taken to cover each instance" in the second model. A Navy pilot and three Martin employes were killed in the crash.

A Martin investigating committee, which pored over the approximately 80% of the first SeaMaster recovered from the Potomac, attributed the crash to six possible failures in the aircraft's control system. The possibilities:

- **Minor explosion** in the center wing stub which may have damaged the control cables, hydraulic lines or electrical circuits.
- **A broken or snagged** control cable.
- **Loss of pilot-feel force** in the longitudinal control system.
- **Loss of one of two** duplicate hydraulic systems coupled with the overpowering of the remaining system.
- **Elimination of hydraulic power** from the stabilizer actuator.
- **Pilot error** in handling the controls.

### Speed No Factor

In its report, the committee also found that:

- **There was no evidence** that excess speed, abnormal aerodynamic forces, aeroelastic effects or powerplant malfunction were initiating causes of the accident.
- **There was no major primary fire**, and all in-flight fires observed by witnesses took place after the aircraft began to break apart.

Salvage operations to recover the SeaMaster prototype were conducted by the Navy from Dec. 8 to March 2 with two salvage vessels, two sonar ships and a small craft equipped with dragging rakes.

### The Break Up

The recovered parts were assembled for study on the floor of the operations hangar at the Naval Air Station, Patuxent River, Md., in their normal positions in relation to other parts. A number of the parts were sent to laboratories for detailed analysis.

The Martin committee, aided by experts from the Navy, Air Force, National Advisory Committee for Aeronautics and the Civil Aeronautics Board, also computed elaborate fall trajectory patterns which show that the SeaMaster's break up occurred over a distance of approximately 3,000 ft. at an altitude of from 6,000 to 3,000 ft. The time required for the break up was estimated at between five and ten seconds.

At the time of the crash, the aircraft had completed a total of 79 flight and taxi-test hours in the Chesapeake Bay area. During its flights, it had performed successfully at speeds greater than the maximum speed calculated to have been achieved during the final flight which lasted for only 14 minutes.

## Sperry System for B-52

**Despite earlier announcement by International Business Machines Corp. that its MA-2 bombing-navigation system (called BRANE) was scheduled for B-52 use, Sperry Gyroscope Co. says its MA-6A bombing-navigation system and associated A-14 automatic flight control system are being installed on B-52s. Sperry now holds a sizable backlog for production of the MA-6A, a modified version of the K-system used on the B-47 and B-36. An Air Force spokesman says the IBM system is scheduled to be phased in when suitable production models become available and is to be used on about half of the B-52s now on order.**

## News Digest

**Boeing 707 topped Mach 0.9** at 35,000 ft. with its refueling boom stowed. The jet tanker prototype also made refueling hookup with a B-47; previous air-to-air refueling connections were with B-52.

**TV transmitter** has been developed by Philco for fighter planes. It is part of small aerial reconnaissance system comprising two cameras which send a sharp picture to a ground control point for recording on 35-mm. film. Equipment is designed to work at supersonic aircraft speeds and high altitudes.

**Airlines order jet simulators:** Pan American Airways purchased two from Curtiss-Wright, one each for the 707 and DC-8 with delivery by 1958 and placed options for two DC-8 and three 707 simulators. United Air Lines has purchased $800,000 DC-8 simulator from Link Aviation, Inc., with installation at Denver planned for 1958.

**Two Martin B-57s** will be used for high speed tests of the delta-wing Convair F-102A fire-control system. Electronic simulation will plot "hits and misses."

**Flat denial of merger** of British Overseas Airways Corp. with British European Airways, or a de-nationalization of either, was made by new BOAC Chairman Gerard D'Erlanger, who said he had the support of the Minister of Transport and Civil Aviation for his statement. Most urgent problem facing BOAC is a review of aircraft requirements for the next 10 years, D'Erlanger said. Committee of top-ranking executives has been named for this study.

**Over $60 million will be spent** by Canadian Pacific Airlines in the next few years on aircraft and larger facilities. CPA has ordered another Bristol Britannia turboprop transport, increasing its order to five. This brings Bristol's Britannia orders to 51.

**Control of ground transport** at Metropolitan Oakland International Airport is won in the courts by the Port of Oakland, which retains the right to grant an exclusive contract for limousine service.

## B-52 Low-Acceptance Rate Explained

**Washington**—**The Air Force last week identified Thompson Products, Inc., of Cleveland, as the manufacturer of the small electrical alternator whose failure resulted in last winter's B-52 crash near Travis AFB, Calif., and the USAF's non-acceptance of 31 of the 78 Stratofortresses produced by Boeing thus far.**

**After the B-52 crash, in which four persons were killed, investigators found that a malfunctioning flywheel within the electrical alternator had set off the chain of events which led to the alternator's explosion and a resultant rupture in the fuel lines. The non-acceptance of the B-52s followed (AW May 7, p. 28).**

**Subsequent investigation showed that the malfunctioning flywheel might be an inherent characteristic in the Thompson alternators (which had successfully met Air Force specifications), but not in those manufactured for the B-52 by General Electric Co. The General Electric alternators were built under slightly-different specifications.**

**An Air Force spokesman said the Thompson specifications have since been altered and that the firm will continue to produce alternators for the Stratofortress.**

# C-123 TURBOJET COMBINATION PROVES OUTSTANDING

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**WEIGHT:** 13,000 lbs. Overload
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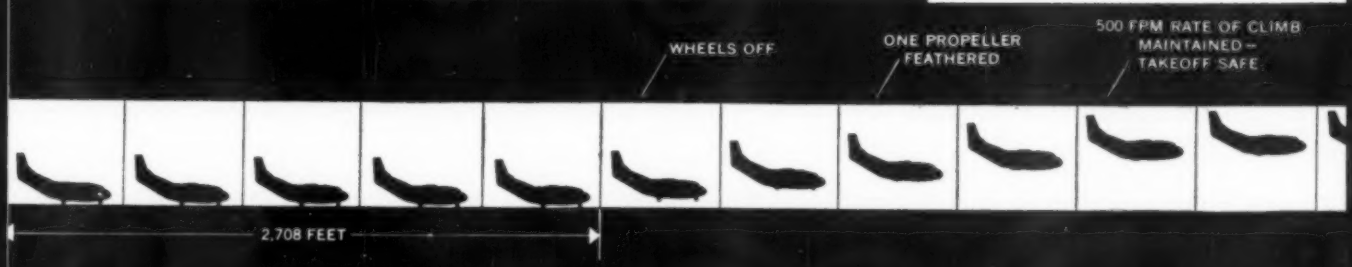
**RESULTS:** Successful




In a recent test for the U. S. Air Force, the Fairchild C-123 proved the value of thrust assist in meeting emergency single engine conditions!

A C-123 was equipped with two Fairchild J-44 jet engines and loaded to achieve gross weight of 66,742 pounds – *13,000 pounds overload.*

During takeoff and climb, both jets were operated to provide 2,000 pounds continuous thrust in addition to the two piston engines. At 2,708 feet, wheels were off the ground, and a moment later at a speed of 122 knots, one propeller was feathered!

From this takeoff position, the C-123 climbed out at 500 feet per minute – proving again its *big job capability and assault versatility,* heightened by jet augmentation to give extra power and extra safety in any emergency.

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## World's Largest Turbo Transporter

## Pours Out Its Power Through SPECO Transmissions

This mammoth turbine-powered helicopter of "1001" uses is the Vertol YH-16A. The production version will be able to carry up to 12 tons and can whirl into action without warm-up to achieve an air speed of over 150 mph. Transferring the output of its turbine into a smooth, steady flow of propelling power is the job of the forward and aft transmissions produced by SPECO, the Steel Products Engineering Division of Kelsey-Hayes.

The manufacture and assembly of gears and gear assemblies which insure dependable, maintenance-free performance such as required in the Vertol YH-16A is a Speco specialty, one of 40 years standing in service to the aviation industry.

**Rotor transmission from YH-16.** The transmissions, clutch assemblies, synchronizing shafts and drive shaftings are produced by Kelsey-Hayes in accordance with Vertol's design specifications.

# KELSEY-HAYES

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## DC-8 Development Lowers Douglas Net

Net sales of $201,026,000 and earnings of $5,113,000 during the first 1956 quarter were reported by Douglas Aircraft Co. In the same period last year sales and earnings totaled $214,824,000 and $7,110,000.

The slippage in earnings reflects additional heavy writeoffs on development of the DC-8 jet transport and flight testing of the DC-7C. A similar situation was shown in Lockheed Aircraft's first quarter report (AW May 7, p. 32).

Douglas backlog as of Feb. 29: $2,363,517,000, of which 40% is commercial aircraft.

The various unfilled airline orders include 110 DC-8s, 101 DC-7Cs, 94 DC-7s and DC-7Bs, 75 DC-6Bs and 15 DC-6As.

Other aircraft industry financial reports include:

• **North American Aviation, Inc.** had a net income of $14.8 million for the six months ended Mar. 31 compared to $14,575,000 in the first half of 1955. Sales totaled $411,921,505, and unfilled orders were $1,163,902,797.

• **Boeing Airplane Co.** reported sales of $170,879,889 and net earnings of $6,156,677 for the first quarter ended Mar. 31 compared to $191,861,192 and $6,040,613 respectively for the same period last year. Backlog Mar. 31: about $2,541,000,000, of which 16% represents commercial jet transport orders.

• **Chance Vought Aircraft, Inc.** had sales of $22,352,186 in the first quarter compared to $26,919,185 in the 1955 period. Net income was $749,293 as against $701,984 last year. Unfilled orders Mar. 31: $238,600,000.

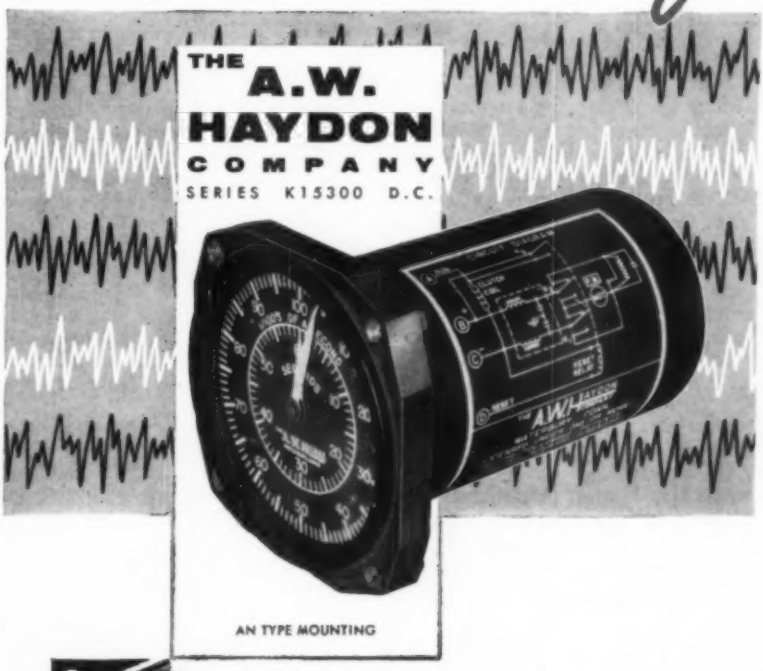
• **Republic Aviation Corp.** consolidated sales totaled $81,789,731 as of Mar. 31 with net income of $2,129,663. Comparative figures in the first quarter last year were $125,903,612 and $3,929,383.

The employe strike beginning Feb. 19 is reported to have accounted for a loss of about $25 million in sales in the first quarter.

• **Curtiss-Wright Corp.** consolidated net profit was $9,196,000 on net sales of $132,641,353 in the first quarter, compared with a net profit of $6,820,707 on sales of $123,496,571 last year. Unfilled orders plus production scheduled on advance orders: $665 million. Some 50% of the firm's earnings were from commercial orders.

• **Aeroquip Corp.** reported sales of $15,471,678 in the first half of fiscal 1956 ended Mar. 31 compared to $10,573,563 in the same period last year. Estimated net earnings came to $673,155 compared with last year's initial half of $850,983.


still going... Strong



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±0.20% of reading ±20ms from −55°C. to 85°C.
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# Foreign Lines Cool to Atlantic Fare Cuts

**Proposals of TWA, PAA would swamp equipment, strain finances, rivals fear; called "too soon."**

By Glenn Garrison

New York—The transatlantic fare reduction proposals of Pan American World Airways and Trans World Airlines appear to be headed into choppy air at the International Air Transport Association traffic conference on May 29 in Cannes, France. The foreign-flag airlines on the transatlantic run aren't saying much publicly about the American carriers' plans, but they will raise some searching questions at the conference table.

- **Equipment.** Is there enough to handle a sharply increased volume of low-fare passengers?
- **Financial.** At drastically lower rates, will airline income be adequate to break even financially?
- **Accommodations.** Are there suitable facilities on both sides of the ocean to take care of a sudden flood of low-budget tourists?

### Low Fare Proposals

Basically, the foreign carriers appear to favor a reduction in tourist fares to tap new markets, but their feeling is that the announced proposals mean too much, too soon.

Pan American proposes a third class of service, at fares 15 to 20% less than present tourist rates. The service would be offered in high-density flights with fueling stops at intermediate points for maximum payload, no free food or drinks; snacks and soft drinks available at passenger's expense. Present tourist service would be designated cabin class, while first class would remain as at present. Pan American would offer all three types of service over heavy-traffic routes, combinations of first and either coach or tourist classes on other routes. The airline says the plan would quickly increase the number of Americans flying abroad by 50%.

TWA's plan calls for a year-round excursion rate with reductions such as $172 for a New York-Paris round trip. A 15-day time limit is set for the round trip. Regular tourist service at present standards would be provided. TWA says the plan would make it possible to balance the east-west flow of transatlantic traffic.

SAS proposes an excursion plan resembling the TWA proposal, except SAS's time limit would be 17 to 23 days. The SAS plan calls for a 30% fare cut, with present tourist service standards. The carrier says its plan will help balance the directional flow.

Pan American's plan for a third class of passengers, on high-density aircraft with a buy-your-own-sandwich type of service, already has come in for some public going over. TWA, announcing its own proposal for reduced rates on regular tourist flights with a 15-day excursion time limit, said "we do not propose to overcrowd or cramp our passengers to give them a cheaper ride." If this could be interpreted as a reference to Pan American's proposal, Scandinavian Airlines System left no grounds for doubt in attacking Pan American.

Warren Kraemer, SAS vice president for sales and traffic in the U. S., called the proposed third class "airborne steerage" and said persons traveling for pleasure "would not tolerate" such minimum accommodations.

SAS, Kraemer said, would offer a plan of its own at the IATA meeting, calling for a 30% fare reduction with a 17-23 day time limit.

### Foreign Caution

Some airline sources wondered if the publicity generated by North American Airlines with its cut-rate transatlantic proposals might not have spurred both Pan American and TWA to announce plans for lower fares. But the foreign-flag carriers are more concerned with

**Red Chinese Start Burma Service**

An Il-14 airliner operated by Red China attracts crowd at Mingaladon Airport in Rangoon when it landed on the first flight of China-Burma air service. The airliner, which has antenna from the mast in front of navigator's dome leading to the rudder, flew from Kunming, China, to Rangoon in four and a half hours. Some thrust augmentation similar to Convair 340 is used.

the basic questions involved in a solution to the transatlantic fare problem.

Their caution in approving any immediate fare cut stems first from the relatively limited amount of equipment they could devote to a mass, low-fare movement over the Atlantic. If a high-density service were inaugurated next year, another problem would be the modification of aircraft now scheduled for delivery by that time.

They are not convinced that an increase in volume would make up for the loss of revenue per passenger at reduced rates. While they foresee mass low-cost transatlantic transportation, especially after high-capacity jet airliners go into service, they want to go more slowly in the matter of fare-cutting and experimentation.

### How Low?

Tourist fares should be as low as possible, the foreign carriers naturally agree, but how low is that? The Pan American proposal calls for a 15 to 20% cut; the TWA plan would reduce the New York-Paris round trip rate $172 from $558 to $386. The foreign-flag airlines want to go more slowly.

Assuming the new low-fare services would tap a huge undeveloped tourist market—and the more conservative carriers are cautious even in that assumption—is either Europe or America prepared to accommodate them? Questions may be raised as to whether there are enough hotels, plumbing, motels and other conveniences to satisfy an onrush of Americans overseas, or whether this country has the low-cost accommodations, the interpreters, other services and the flexibility under immigration laws, to handle a large volume of Europeans with limited funds.

This is negative reasoning, and the carriers will agree that demand will create the facilities, but they seem to desire less haste.

The Civil Aeronautics Board is under some criticism for its disapproval in February of the fare structure set up by IATA last October. Critics claim CAB should have moved more quickly, before tariffs were prepared. Shortly after voting its disapproval, CAB issued a temporary approval good only until Oct. 1.

# PAA Offers New Puerto Rico Plan

A new cut-rate air service for the rich route between New York and San Juan, Puerto Rico, was proposed last week by Pan American World Airways.

Pan American has filed a tariff with the Civil Aeronautics Board calling for a third-class air service on the route at rates about 20% under current tourist fares. The San Juan proposal follows closely upon Pan American's announcement that it will support a third-class International Air Transport Association fare on transatlantic routes.

The decision to operate a cut-rate service came as the CAB began a full-dress investigation of air service between Puerto Rico and the continental United States. The Commonwealth of Puerto Rico has been highly critical of present service and supports a low-fare shuttle type of service.

Under the Pan American plan, three types of air service would be offered to New York-San Juan passengers. First-class service would remain at $100 one way, and tourist service would become cabin class with a $67.50 fare. Eastern Air Lines and Pan American now charge $64 for tourist flights.

### High-Density Plan

The new service would be offered at $52.50 with high-density seating and fewer passenger services. Seats would be spaced 34 inches apart and no free meals would be served. The plan is subject to CAB approval.

Pan American's proposal comes closer to the kind of service Puerto Rico has been campaigning for than do current services. The Commonwealth government is pressing for more routes and cheaper service.

The CAB investigation now getting under way combines Puerto Rico's request for an investigation with Eastern's application for renewal of its New York-San Juan route on a permanent basis. Also included in the general review of service are applications filed by eight other airlines.

Eastern's original five-year authority came up for review when it expired last March. Riddle Airlines' authority to carry cargo between New York and San Juan via Miami also expired in March, and Riddle's renewal is included as an issue.

### CAB Investigation

Last September, Eastern asked the Board for separate, expedited treatment of its renewal application. The carrier also wanted the CAB to dismiss an investigation of its service between Miami and San Juan.

Puerto Rico objected to quick action on Eastern's application, and in December the Commonwealth asked for a full investigation. The principal points in Puerto Rico's complaint against present service were that the island needs connections with more mainland points than New York and Miami and that Puerto Ricans need a "sky-bus service" at fares lower than present levels.

The CAB decided to limit its investigation to service between Puerto Rico and points on the mainland. Hearings are tentatively scheduled for July 17 in Washington, and the case now includes applications filed by Capital Airlines, Caribbean-Atlantic Airlines, Delta Air Lines, Eastern Air Lines, National Airlines, Pan American World Airways, Riddle Airlines, Trans Caribbean Airways and United States Overseas Airlines.

## Committee May Hear Tacan/DME Decision

Long-awaited statement on resolution of the Tacan/DME controversy may be made by Air Force Secretary Quarles May 18 before the House Aviation Subcommittee, providing final compromise details can be hammered out in time by the Air Navigation and Development Board. Rep. Oren Harris (D.-Ark.) is chairman of the subcommittee.

Air Force and Navy efforts to improve accuracy and reliability of Tacan equipment appear to be paying off. Recent tests by the Rome Air Development Center on an operational network of seven Tacan ground stations showed total ground-airborne bearing errors of 0.55 to 0.9 degree.

Distance errors were no more than 0.2 nautical miles, according to an RADC spokesman.

Ground station equipment operated for an average of 553 hours between failures, or 709 hours if personnel-caused failures are excluded. Airborne sets operated an average of 129 hours between failures, using modified equipment produced in 1955.

RADC reports no interference between adjacent channel Tacan ground stations and little interference between two stations 180 miles apart which operated at same frequencies. RADC tests also indicate that a Tacan ground station can handle 122 aircraft without saturation.

## North American Airlines Selects New Name

**Burbank**—North American Airlines last week took on the new name of Trans American Airlines following the U. S. Supreme Court refusal to review the airline's "name case" (AW May 7, p. 40).

The North American group said the change will cost them more than $200,000 involving advertising, tickets, airplane repainting and neon signs.

The change is the result of complaints made in the courts by American Airlines and North American Aviation, Inc., that the nonsked's title was too close to their own.

# CAB Review of Airline Fares Seems Certain, Pressure Mounts

By L. L. Doty

A general investigation of airline passenger fares appeared last week to be virtually inevitable.

Increasing and authoritative pressure was being exerted by the House Anti-Trust Subcommittee and the General Accounting Office. Similarly strong opinions were being voiced in the House of Representatives.

Rep. James M. Quigley (D.-Pa.), a member of the subcommittee, declared that testimony heard so far regarding the need for such an investigation displayed a "scandalous abdication of responsibility" on the part of the Civil Aeronautics Board for allegedly failing to study the fare problem more closely.

On the House floor, Rep. Emanuel Celler (D.-N. Y.) said testimony given by Comptroller General Joseph Campbell, of the General Accounting Office, indicated that failure to hold an inquiry into airline fares was unpardonable.

### GAO—House Criticism

Campbell previously had testified he was under the impression that one study of fares by the CAB had been cut short because of an "apparent lack of interest by the board."

Campbell also was critical of the CAB's failure to formulate a long-range route development program. He said the General Accounting Office had recommended that the CAB launch a full-scale probe of all aspects of routes served by domestic, international and territorial carriers to determine both present and future needs. He also asked for a CAB research program to help pave the way for the absorption of commercial jet airliners into the national route pattern.

Celler was supported in the house by Rep. Sidney Yates (D.-Ill.), who accused the CAB of "being derelict in not adequately pursuing its rate-making and service functions."

### ATA Defense

Stuart G. Tipton, president of the Air Transport Association, defended the CAB's present tariff-study practices and told the subcommittee that an investigation would be like "spending a fortune to prove that water is wet."

Tipton said such an investigation probably would result in a CAB recommendation for a fare increase rather than a decrease. He added, however, that the scheduled-airline industry neither opposes nor fears a general rate review. He expressed satisfaction with the job the CAB is now doing in governing fare levels and argued that the agency had done extensive work in the fare-regulation field.

Quigley expressed the fear that the CAB's approach to the fare problem runs the risk of being unfair to the public, the airlines or to both. He said the CAB is under obligation to keep "on top of the fare question" at all times.

At this point, the ATA took issue with Quigley, who acted as subcommittee chairman in Celler's absence.

Donald Markham, ATA's assistant general counsel, questioned whether the best way "to stay on top of a business like our business is to hold a formal proceeding which will extend over a period of 18 to 36 months in which you are largely bound by a formal record."

He said the CAB now followed a procedure which was partially formal and partially informal. In this way, he added, the CAB can continuously keep tab on fare levels and act at any given time. He said that more-or-less constant staff studies are conducted and that most of the principal issues which would be brought out in a general investigation are produced by the studies.

Markham pointed out that there have been hundreds of mail-rate cases which have achieved the same results that an investigation might be expected to achieve.

### Previous Fare Decreases

He also cited passenger fare revisions since 1943 as an indication that the tariff problem has not been neglected.

Fares were decreased by 10% in 1943 and another 10% decrease followed in 1945. Later that same year, a fare adjustment ranging from a 3% increase to a 7% decrease was instituted in an attempt to seek a more equitable fare level.

Two 10% increases were granted in 1947; one in April, the other in December. This was during a period when the airlines were experiencing their own private depression, Markham said.

Although a 10% increase was allowed in 1948, family fares and round-trip discounts were inaugurated then.

The last fare change occurred in 1952 when $1.00 was added to existing one-way and round-trip fares.

Tipton enlarged upon his "no-opposition, no-endorsement" stand by detailing reasons for his position. An investigation is not opposed because:

- **An investigation** would prove that scheduled airline service is one of the best bargain buys in the country.
- **It would publicize** reduction of prices despite rising costs and would show that 1956 fares, which are still declining, are held at 1938 levels.
- **A need for greater earnings** would be demonstrated.
- **Many persons would be better** acquainted with the achievements and problems of the airline industry.

Tipton's reasons for not endorsing an investigation are:

- **The industry and government** would expend great quantities of time and money to prove what is already known.
- **Fares have been subjected** to scrutiny continually and repeatedly by the CAB.
- **Investigations of the type** proposed create doubt as to an industry's future.
- **Tumult bound to beset** the industry during the investigation would bring great comfort to those who seek to undermine scheduled air transportation.

### Denny Vote Switch

In his testimony, Tipton denied any attempt to sway CAB member Harmar D. Denny to vote against a rate investigation (AW May 7, p. 39). Denny had voted with the majority for the investigation April 10, 1953, but switched his vote on April 23 which resulted in a decision to drop the inquiry. Presumably, Tipton met with Denny between the two CAB sessions, but Tipton could not recall the exact date.

Tipton told the group that he would be "greatly surprised if Colonel Denny was influenced by anything I said to him during that discussion." He added that he had no way of knowing what changed Denny's vote and they did not discuss the merits of the case.

In answer to a query as to whether or not the scheduled airlines had ever made an attempt to recommend prospective CAB members, Tipton stated that he could not remember any instance in which the board of directors actually made a joint recommendation for appointment. He saw no danger in such a policy, however, and said that "to make good recommendations for good men" for a seat on a regulatory agency seemed the "perfectly sensible thing to do" by groups controlled by that agency.

## Cruzeiro Buys Safaris

**Cruzeiro do Sul, international Brazilian airline, has purchased 10 Frye F.1 Safari combination passenger-cargo transports for short and medium-range internal services. Delivery will begin late in 1957. Earlier orders were placed by Northern Consolidated Airlines, three with option for two, and Wien Alaska, three. Options have been placed on 42 delivery positions, Jack Frye, president, states.**

# Pan American, Other Airlines Report on Executive Salaries

**Washington**—Reports of officers and directors of scheduled airlines have filed the following reports of salaries and compensation with the Civil Aeronautics Board:

**Pan American World Airways, Inc.,** J. T. Trippe, president and director, $20,000 salary, $2,350 directors fees; J. C. Leslie, vice president and director, $30,000 salary (up $1,000), $1,000 director's fees (down $100) and $16,000 bonus and indirect compensation (up $1,000); H. J. Friendly, vice president, general counsel and director, $30,000 salary (up $1,000), $1,000 directors fees (up $100) and $16,000 bonus and indirect compensation (up $1,000); S. F. Pryor, vice president, assistant to the president and director, $29,500 salary (up $500), $1,650 director's fees (down $200) and $15,000 bonus and indirect compensation; Franklin Gledhill, vice president and director, $29,000 salary, (up $1,000), $1,100 directors fee (down $100) and $15,000 bonus and indirect compensation (up $1,000); H. E. Gray, executive vice president-Atlantic Division, $29,250 salary (up $1,250), $15,000 bonus and indirect compensation (up $1,000).

W. L. Morrison, executive vice president-Latin American Division, $29,250 salary (up $1,250), $15,000 bonus and indirect compensation (up $1,000); W. G. Lipscomb, vice president-traffic and sales, $29,000 salary (up $1,000), $15,000 bonus and indirect compensation (up $1,000); A. P. Adams, vice president, $26,500 salary (up $500), $12,000 bonus and indirect compensation (up $1,000); Erwin Balluder, vice president, $27,250 salary (up $250), $11,000 bonus and indirect compensation; C. M. Young, executive vice president-Pacific Division, $25,750 salary (up $750), $10,000 bonus and indirect compensation (up $1,000); H. H. Berke, vice president, $21,000 salary, $9,000 bonus and indirect compensation; R. B. Adams, vice president $22,000 salary (up $1,000), $7,000 bonus and indirect compensation (up $1,000); H. W. Toomey, vice president, $20,000 salary, $2,500 bonus and indirect compensation; A. A. Priester, vice president (deceased 11-28) $18,222 salary; R. Lewis, executive vice president-development and defense (elected 10-18), $5,687 salary, $5,000 bonus and indirect compensation; H. M. Bixby, vice president and director (resigned 7-1), $7,000 salary, $3,550 director's fees.

E. M. Goulard, vice president (elected 9-13), $5,125 salary, as assistant vice president, $10,500 salary, $4,000 bonus and indirect compensation; R. S. Mitchell, vice president-Guided Missiles Range Division (elected 11-1), $3,083 salary, $5,000 bonus and indirect compensation; J. S. Woodbridge, comptroller, $22,500 salary (up $500), $9,500 bonus and indirect compensation (up $500); R. G. Ferguson, treasurer, $22,500 salary (up $500), $9,000 bonus and indirect compensation; H. P. Morris, secretary and general attorney, $14,000 salary, $3,000 bonus and indirect compensation; W. W. Lynch, assistant vice president, $19,120 salary (up $760); $4,000 bonus and indirect compensation; S. B. Kauffman, assistant vice president, $17,250 salary (up $250), $5,000 bonus and indirect compensation (up $1,000); J. C. Cone, assistant vice president, $16,000 salary, $5,000 bonus and indirect compensation; W. J. McEvoy, assistant vice president, $13,000 salary, $3,000 bonus and indirect compensation; R. P. Monson, assistant treasurer, $15,250 salary (up $250), $6,000 bonus and indirect compensation; J. E. McGuire, assistant comptroller, $12,250 salary, $1,000 bonus and indirect compensation; E. G. Rothrock, assistant secretary, $11,460 salary (up $180), $1,000 bonus and indirect compensation; Josiah Macy, Jr., assistant secretary, $12,400 salary; J. J. Cantwell, assistant secretary, $8,945 salary (up $485), $750 bonus and indirect compensation.

S. M. Fairchild, director, $900 director's fees (down $200); R. V. Fleming, director, $1,800 director's fees (up $200); Merrill Griswold, director, $1,400 director's fees (down $400); R. L. Hamill, director, $1,300 director's fees (down $100); R. W. Howard, director, $1,700 director's fees (up $700); D. S. Ingalls, director, $1,200 director's fees (up $100); Robert Lehamn, director, $1,000 director's fees (up $100); E. O. McDonnell, director, $5,000 director's fees; M. T. McKee, director, $5,000 director's fees; J. S. Rockefeller, director, $900 director's fees (down $300); W. H. Standley, director, $700 director's fees (down $500).

Campbell, Brumbaugh, Free and Graves, legal services, $28,850 (up $16,515); Cleary, Gottlieb, Friendly and Hamilton, legal services, $150,719 (up $42,879; Dewey, Ballantine, Bushby, Palmer and Woods, legal services, $18,500; H. Don Reynolds, legal services, $22,500; Roosevelt, Freidin and Littauer, legal services, $15,000; Skadden, Arps and Slate, legal services, $27,837 (up $8,167); Steptoe and Johnson, legal services, $28,500 (up $500); Dickie Raymond, Inc., advertising services, $19,800 (up $1,800); J. Walter Thompson, advertising services, $65,492 (up $22,134); **Loomis, Suffern and** Fernald, accounting services, $65,965 (down $33,111); Paul Aiken, airmail traffic consulting services $14,400; George B. Buck, consulting actuary, $13,310; Julius Klein, public relations services, $12,000; Peter O. Mattei, building contracting services, $17,218; Lowell A. Mayberry, building contracting services, $34,000; Sanderson and Porter, engineering services, $18,631.

**Northwest Airlines, Inc.,** Donald W. Nyrop, president and chief executive officer, $52,000 salary; Malcolm S. Mackay, executive vice president, $30,000 salary (up $737); Frank C. Judd, vice president-operations and engineering, $25,000 salary; James W. Mariner, vice president-sales, $18,000 salary; Linus C. Glotzbach, vice president-personnel, $23,000 salary (up $1,000); Lawrence B. Kinports, vice president-orient region, $13,785 (down $3,254); A. E. Floan, vice president and secretary, $22,000 salary (up $1,000); Leonard S. Holstad, comptroller, $20,000 salary (up $295); William J. Eiden, treasurer, $20,000 salary (up $606); Alroy D. Piepgras, assistant comptroller, $12,000 salary; Donald H. Hardesty, assistant treasurer, $12,000 salary; Frank J. Scott, assistant secretary, $9,600 salary; Dale Merrick, assistant vice president-properties, $13,000 salary; C. L. Stewart, assistant vice president-plans, $13,250 salary (up $2,250); P. L. Benscoter, vice president-orient region, $8,100 salary.

Croll Hunter, chairman of the board of directors, $50,000 salary; James H. Binger, director, $700 salary (up $200); Morton H. Fry, director, $1,200 salary (down $3,533); Robert M. Hardy, director, $900 salary (up $200); Joseph T. Johnson, director, $900 salary (down $5,200); Alonzo Petteys, director, $1,200 salary (down $200); C. Frank Reavis, director, $800 salary (down $1,059); Albert G. Redpath, director, $1,100 salary (down $100); William Stern, director, $10,800 salary (up $800); Albert F. Tegen (resigned 12-30), director, $800 salary; Lyman E. Wakefield, director, $1,000 salary (down $100); Albert J. Weatherhead, director, $600 salary (down $300); Weelock Whitney, director, $1,000 salary (down $200).

Ernst and Ernst, accounting services, $44,919 (up $15,631); Daniel M. Peterson, promotional and publicity service, $54,765 (up $36,044); Harold R. Harris, payment to former president due 1-2-55 under termination agreement dated 3-4-54, $20,000.

**Allegheny Airlines, Inc.,** Leslie O. Barnes, president and director, $22,499 salary (up $5,833); Everett K. Arnold, vice president and secretary, $10,799 salary (up $799); David L. Miller, vice president-traffic-and-sales and director, $10,799 salary (up $799); Walter J. Short, vice president and treasurer, $11,666 salary (up $1,666); Jean Langsdale, assistant secretary (resigned 8-26) $2,622 salary; Hale, Stimson, Russell and Nickerson, legal counsel, $28,000 (up $10,000).

**Bonanza Air Lines, Inc.,** Edmund Converse, president and director, $16,667 salary (up $1,667); Florence J. Murphy, vice president, secretary and director, $9,784 salary (up $1,159); R. H. Herrnstein, treasurer, $10,834 salary; Vl Geer, assistant secretary, $1,145 salary.

**Central Airlines, Inc.,** Keith Kahle, president and director, $13,916 salary (up $1,916); F. E. Howe, executive vice president and director, $12,958 salary (up $958); John L. Blackwell, vice president-operations, $9,600 salary; Alicia H. Pritchett, assistant secretary, $4,380 salary (up $88); Pogue and Neal, legal services, $11,116.

**Frontier Airlines, Inc.,** C. A. Myhre, president and director, $20,000 salary (up $5,230); J. D. Lindsay, vice president-traffic-and-sales, $12,000 (up $3,059); E. N. Levin, secretary and director, $7,800 salary; L. P. Blatter, treasurer, $11,000 salary (up $2,532); E. W. Sexton, assistant treasurer, $6,435 salary (up $285); Rippey, Henderson, Kosta, advertising agency, $145,911; Bowen and Scoutt, legal services, $12,000.

**Hawaiian Airlines, Ltd.,** Arthur D. Lewis, (elected 2-16) president and director, $23,981 salary, $1,726 bonus and indirect compensation; Brian Cooke, vice president-treasurer, $13,733 salary, $621 bonus and indirect compensation; Lionel D. Machado, (elected 5-26) vice president-operations, $16,339 salary, $660 bonus and indirect compensation; Jack C. Tobin, (elected 10-1) vice president-sales, $4,250 salary, $283 bonus and indirect compensation; George K. Tanabe, assistant treasurer and assistant secretary, $9,359 salary, $50 bonus and indirect compensation; John S. Pugh, secretary, $7,883 salary (resigned 2-1); Stanley C. Kennedy, chairman of the board, $7,000 salary, $260 bonus and indirect compensation; Ford Studebaker, (resigned 3-14) executive vice president and director, $12,325 salary, $100 bonus and indirect compensation; David Watson, vice president, treasurer and director, $17,856 salary (up $2,356), $280 bonus and indirect compensation (up $100).

M. B. Carson, director, $200 bonus and indirect compensation (down $120); James Greenwall, director, $1,430 bonus and indirect compensation (up $690); Thomas Guard, director, $280 bonus and indirect compensation, (up $60); Dudley C. Lewis, director, $260 bonus and indirect compensation, (down $260); P. K. McLean, director, $260 bonus and indirect compensation (up $20); J. E. Russell, director, $220 bonus and indirect compensation (down $20); W. C. Tsukiyana, director, $220 bonus and indirect compensation (down $80); R. Von Tempsky, director, $200 bonus and indirect compensation (down $40); George Vickers, director, $300 bonus and indirect compensation (down $40); H. W. B. White, director, $1,420 bonus and indirect compensation (up $680); G. P. Wilcox, director, $80 bonus and indirect compensation (down $40); George S. Wong, director, $260 bonus and indirect compensation; McKinsey and Company, organizational study, $13,300.

**Lake Central Airlines, Inc.,** Harry V. Wade, trustee, $1,500 bonus and indirect compensation (down $1,300); J. J. O'Connell, Jr., trustee and director, $800 bonus and indirect compensation; R. B. Stewart, director, $4,267 salary (up $933); Gwin Hicks, president and director, $15,000 salary; L. W. Hartman, vice president, treasurer and director, $12,277 salary (up $2,108); R. W. Clifford, vice president and director, $12,000 salary (up $451); William H. Krieg, secretary and director, $1,350 bonus and indirect compensation (down $50); Cecil A. Berry, director, $600 bonus and indirect compensation (down $50); D. S. Getchell, vice president, $9,000 salary (up $550); J. L. Corey, assistant treasurer, $7,778 salary (up $668); Albert Grisard, legal services, $12,559 (up $1,464).

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## Continental Plans Los Angeles Jet Base

**Los Angeles**—A large jet-engine overhaul and maintenance base will be built at Los Angeles International Airport, according to Robert F. Six, president of Continental Air Lines.

"It is quite possible Continental Air Lines will move its general headquarters from Denver to Los Angeles if the pending route applications are granted," Six predicted, adding that in such an event the airline would still keep a major base in Denver.

Six stated that Continental will open service May 1, 1957 on its Los Angeles-Denver-Kansas City-Chicago route with DC-7Bs; introduce Vickers Viscounts in July, 1958 and Boeing 707s August, 1959 (AW Dec. 19, p. 91). The airline has authority to fly Los Angeles-Chicago nonstop, but Six said he did not plan to get into the nonstop competition until 707s are in service.

In its first step toward entry into the Los Angeles air traffic market, Continental will start construction of the $2.5 million facility this summer. Completion date is set for early spring, 1957.

The maintenance and overhaul base will be built in two stages, Six said, with possibly a third and final addition in 1959 or 1960. It will include 71,300 sq. ft. of space, underground storage for over 200,000 gal. of fuel and employ upwards of 500 people.

Initially, Continental will schedule three round trips daily over the 1,254-mi. route between Los Angeles and Chicago with two of the three DC-7B trips operating as all-coach flights. First class service will be known as the "Golden Arrow" service accommodating 64-passengers; coach service—"Silver Arrow"—will seat 94 passengers.

Schedules will be increased to seven flights daily upon introduction of the Viscounts. The airline is confident the traffic will bear such scheduling, citing Capital Airlines' traffic rise on the Chicago-Washington run from 12% at the outset to 60% of the traffic on this route by February. Continental's 15 Viscounts will be advanced version of the 810D model using a RDa-8 Rolls-Royce engine which will increase cruising speed from 365 mph. to 400 mph.

Continental is hopeful of expanding its operations in the West, Six said. The airline recently applied to the Civil Aeronautics Board for authority to operate from Los Angeles to Denver via Phoenix and San Diego and from Los Angeles to Denver, Phoenix and Palm Springs. A petition also has been made for new services to link Los Angeles and Dallas, a service Continental now provides on an interchange basis with American Airlines.

**SCHOOL TEACHERS** learn about approach radar at a typical air age session.

# Elizabeth Schools Help to Erase Rancor Left by Three Air Crashes

Public school teachers in Elizabeth, N. J., have been taught to "sell" aviation in their classrooms. More than half of the city's teachers have gone to nearby Newark Airport for briefings on the significance of air transportation and how to relate it to their curricula. They have inspected the airport, and have flown in a modern airliner—the majority of them for the first time.

The teachers and school officials are among some 6,000 educators—teachers, principals, superintendents and other officials—who, since the beginning of 1953, have attended the air age education institutes of the National Air Transport Coordinating Committee.

Elizabeth perhaps is the most striking example of the value of the program, for aviation was a swear word in that aroused community following three major crashes in late 1951 and early 1952. And the city—especially its daily newspaper and some public officials—is still far from resigned to the airport's proximity.

### Wide Circulation

Elizabeth teachers are only a small minority of the educators throughout the New York-New Jersey metropolitan area covered by NATCC's education committee in the 93 institutes held to date. In addition to the institutes, the committee's program has reached 27,500 teachers and pupils directly through airport guided tours, and another 500 teachers through air age education workshop courses in the area's schools.

Indirectly, NATCC estimates that a million school children have been reached by the teacher education program and they in turn have passed some of it along to the adults in their families.

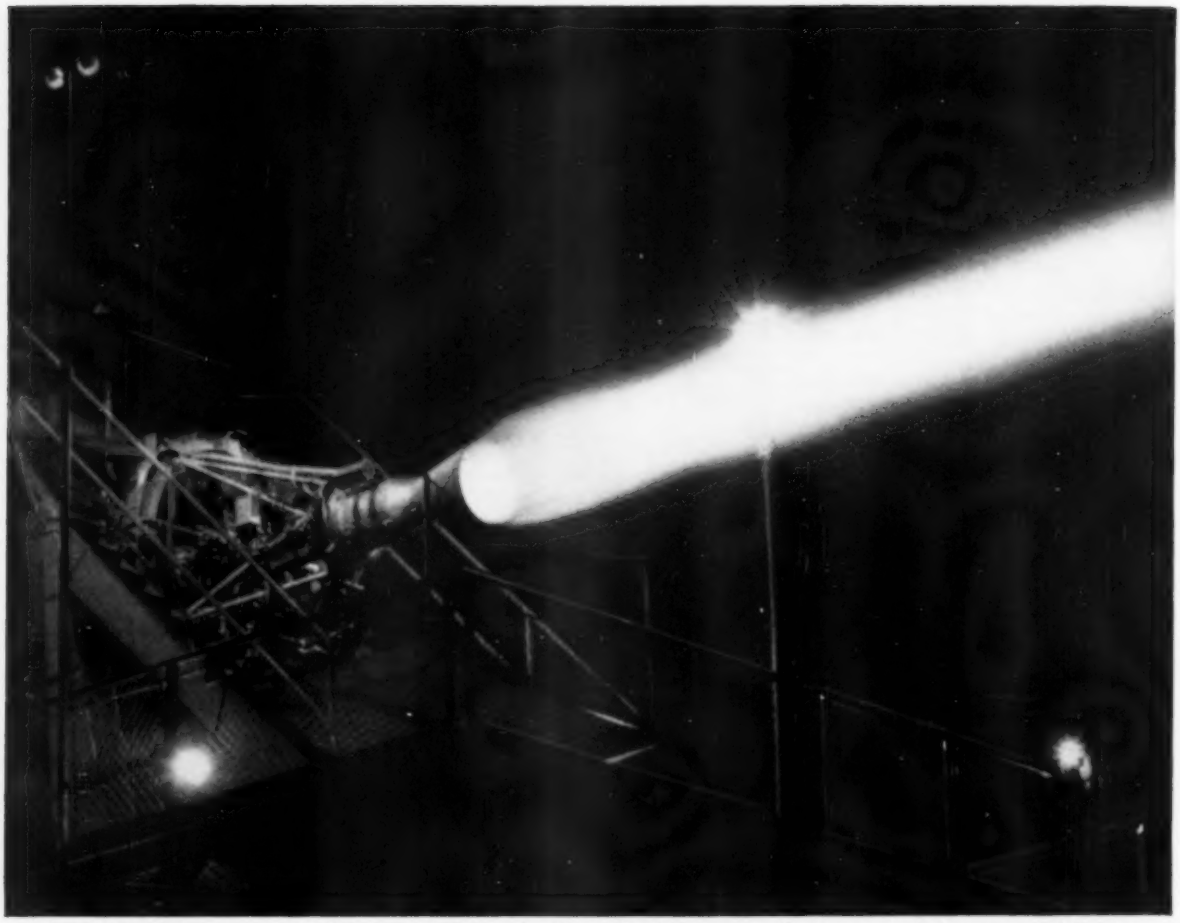
NATCC itself was created as a result of the Elizabeth crashes, with air carriers, pilots, airport operators, the government aviation agencies and aircraft manufacturers joining forces against the hornet's nest of public reaction. The education committee was formed in January, 1953, and its present membership includes one representative each from Civil Aeronautics Administration, Port of New York Authority, Pan American World Airways, Trans World Airlines, Northeast Airlines, United Air Lines, Eastern Air Lines and American Airlines, and two NATCC staff members.

Besides its own program work, the committee advises the Superintendent of Schools in Newark, the Board of Higher Education in New York City and the Aeronautics Education Commission of the New York City Board of Education. The NATCC committee, along with the New York City Board of Curriculum Research, forms the Aviation Education Coordinating Committee of New York City.

### Not New Idea

The aviation institute is not a new device. It was employed by CAA in 1944, when there was one "educationist" to each of the then seven CAA regions, but its present use in the New York area is on a greater scale than ever before.

In 1951, there was only one institute in this area, and there were only two the following year. Both were directed



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BUILDERS OF POWER FOR OUTER SPACE

by CAA's James V. Bernado, a former educationist, now assistant regional director for aviation development (he is also chairman of the NATCC committee).

With the creation of the NATCC committee, and the implementation of its program, the total went to 20 New York City institutes in 1953, and New Jersey educators attended four that year at Newark Airport. So far this year, the committee has held eight for New York City units, nine in New Jersey, and five on Long Island.

In a recent session—held April 25 for administrators and teachers of school districts 10 and 11, Manhattan—the committee for the first time made use of its new education center in the Federal Building at New York International Airport, which contains a mockup of a control tower panel, with instruments and an ASR radar scope. The mockup is in "radio" communication with a Link trainer in another part of the room, so the educators can listen in on simulated transmissions between various aircraft in the traffic pattern.

The tower mockup, incidentally, was originally built for use in a forthcoming Air Transport Assn. movie.

With the realistic mockup, the committee neatly compensated for the loss of a box-office smash—the visit to the 11-story-high control tower which formerly was an institute highlight.

### Typical Program

The Manhattan educators spent about 6 hours at this typical institute. They participated in a panel discussion on aviation in the curriculum, ate a buffet supper (Dutch), were briefed on aviation operations by two speakers, toured the new United Air Lines hangar at Idlewild, and ended with a DC-7 ride, courtesy of United (the airlines now rotate this service).

Of the 52 educators at this session, 22, including an assistant superintendent, had never been up in a plane before.

The education committee is booked through next October with as many institutes as it can handle. The bookings come through representatives of the New York and New Jersey school systems; NATCC doesn't go looking for business any longer, though they did approach the schools when the program was first set up.

An exception was an institute scheduled in February for all Nassau County school superintendents. This was designed to stir interest in communities near New York International Airport, where anti-airport sentiment exists. Educators of Malverne and Valley Stream, two communities in the Idlewild runway approaches, attended an institute last week.

The director of the bureau of curriculum research of the New York City Board of Education has called it "one of the most important teacher training ventures for New York City teachers," and the assistant superintendent of schools in Newark has found it "of great value to all who participated" in bringing about a greater understanding of the importance of aviation in modern living.

## CAB ORDERS

(April 26—May 2)

**GRANTED:**

**Pan American World Airways** permission to intervene in the case involving Linea Aereas de Nicaragua's application to operate between Managua and Miami via Guatamala City and San Salvador.

**British Overseas Airways Corp.** permission to serve Detroit through Willow Run Airport for sixty days to allow time to consider objections.

**British Overseas Airways Corp.** permission to serve Chicago through O'Hare Airport as an alternate to Midway.

**Purdue Aeronautics Corp.** an exemption to perform: intermittent charter flights between points in the U.S. and Montreal, Toronto and Havana pursuant to contracts with the Columbus Jets baseball team and the Miami Marlins baseball team; two round trips between Cincinnati and Lac Des Loups, Ontario, pursuant to a contract with James Thomas; two-and-one-half round trips between Louisville and Kenora, Ontario, pursuant to a contract with Brown-Forman Distillers Corp., and one round trip between Lafayette, Ind., and Kenora, Ontario, pursuant to a contract with Schiele and Finnell Bros.

**Permission to intervene** in the Quad Cities-Twin Cities Service Case to the City of Moline, Ill., and the Assn. of Commerce of Moline; the City of East Moline and the East Moline-Silvis Assn. of Commerce; the City of Rock Island, Ill., and the Rock Island Chamber of Commerce.

**Bonanza Air Lines** authority to suspend service at Burbank, Calif., on segments two and three of Route 105 until sixty days after the final decision in the Reopened Bonanza Renewal Case.

**North Central Airlines** an exemption to lease a DC-3 aircraft from Harry Hill.

**Permission to intervene** in the Seven States Area Case to American Airlines, Capital Airlines, Continental Air Lines, Northwest Airlines and 41 communities and organizations.

**Flying Tiger Line** an exemption to perform transatlantic charter flights pursuant to contracts with the Student Government Council of the University of Michigan, the Uhland Bund Singing Society, The Knights of Columbus, Council 2690; Hempstead Liederkranz Inc., and XON Christian Orthodox Church of Sts. Constantine and Helen Greek Orthodox Church. Applications to perform four other charters were denied.

**United States Overseas Airlines** an exemption to perform one charter flight from Charlotte or Raleigh, N. C., to Keflavik, Iceland, in lieu of the Flying Tiger Line.

**Seaboard and Western Airlines** an exemption to carry Sidney Grant of the Jasan Co. on two round trip flights between New York and Frankfurt via London.

**APPROVED:**

**Agreements** involving Trans World Airlines, Delta Air Lines and other carriers relating to intercarrier arrangements.

**Interlocking relationships** between Sherman M. Fairchild, Pan American World Airways and Fairchild Engine and Airplane Corp., for sixty days.

**Flying Tiger Line's** petition for reconsideration of earlier CAB action denying an exemption to perform two charter flights for American Youth Hostels.

**ORDERED:**

**American Air Export** and Import Co., Riddle Airlines, Slick Airways and the Flying Tiger Line to show cause why their service rates for carrying air mail should not be set at the multi-element rates set for the trunk airlines last year.

**Investigation of Northwest Airlines** and Capital Airlines' 30-day notice rule and one-year limitation rule issued in 1947. Following a complaint filed by Anita Herman.

**Alaska Airlines'** authority to suspend service at Akulurak, Alaska, extended until sixty days after final decision in the Intra-Alaska Investigation Case.

**Investigation** of the proposed cancelation by Northwest Airlines of a rule which provides departure times for coach-freighter flights. United Air Lines has filed a complaint against the cancelation, and it was suspended by the CAB pending investigation.

**Investigation** of certain 30-day group excursion fares proposed by Pan American World Airways, S. A. Empresa de Viacao Aerea Rio Grandense, Canadian Pacific Airlines and Aerolineas Argentinas Fama.

**DISMISSED:**

**Application of Universal** Air Freight Corp. and Gill R. Wilson for approval of interlocking relationships for lack of prosecution.

**Flying Tiger Line's** application to perform a charter trip between New York and London for the Student Council of the School of Foreign Service, Georgetown Univ., at the request of the applicant.

**DENIED:**

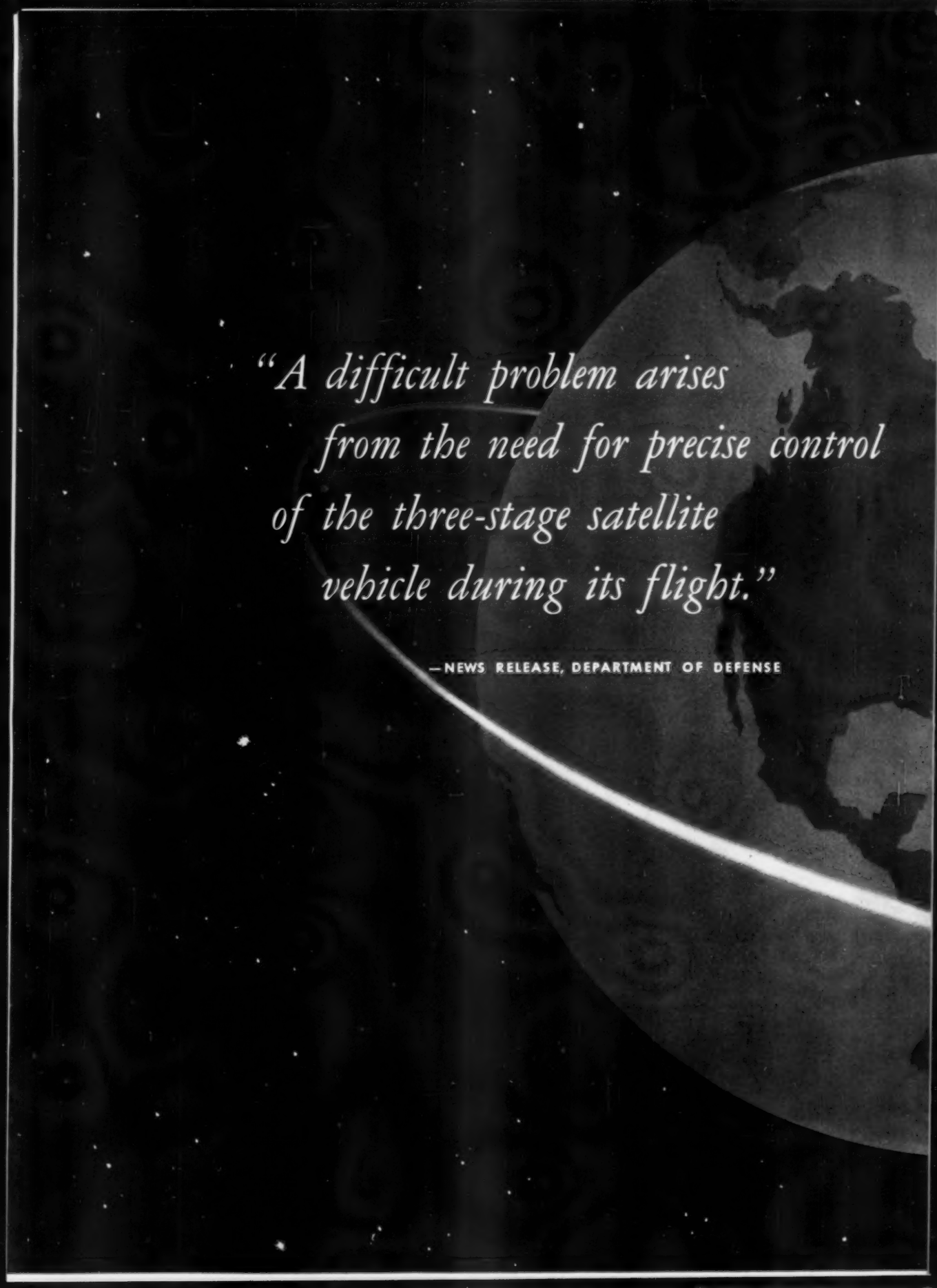
**Braniff Airways'** motion to limit the scope of the Fort Worth Service Case.

**Braniff Airways'** petition for reconsideration of earlier CAB action instituting an investigation to determine whether the carrier should continue to serve seven points in North Dakota, South Dakota, Nebraska and Minnesota.

**Allegheny Airlines'** motion to consolidate its application for a Huntington-Portsmouth-Cincinnati route with the Portsmouth Service Case. Permission to intervene in the case was granted to Trans World Airlines, Piedmont Aviation, City of Columbus, Ohio, and the Cincinnati Chamber of Commerce.

**Allegheny Airlines'** motion to consolidate the application for a Newark/New York-Scranton/Wilkes Barre-Hazleton-Harrisburg-Washington, D. C. Route with the Hazleton Service Case.

**Northwest Airlines'** petition for reconsideration of earlier CAB action denying authority to operate local service between Great Falls and Butte and Helena, Mont.


"A difficult problem arises
from the need for precise control
of the three-stage satellite
vehicle during its flight."
—NEWS RELEASE, DEPARTMENT OF DEFENSE

## Honeywell and Project Vanguard

"PRECISE CONTROL," in Project Vanguard terms, is a difficult problem indeed.

Guidance and stabilization of the rocket vehicle that places the first man-made satellite in its orbit must be accurate beyond precedent.

To help in achieving this accuracy is Honeywell's job.

For the Martin Company, prime contractor, Honeywell will provide a basic three-axis reference system for guiding Vanguard through the first two stages of flight—crucial stages that will place the satellite in its orbital position.

Honeywell's famous HIG-6, the most accurate gyroscope ever made, will be the heart of the Vanguard reference system. Three of these gyros, plus the necessary system equipment, will be packaged for mounting in the giant rocket vehicle.

The super-accurate HIGs, sensitive to the slightest motions of pitch, roll or yaw, will detect—and correct—any deviation from course.

Honeywell's HIG gyros have been proved thousands of times in a variety of guidance and control applications. The HIG now is ready for its biggest job—Project Vanguard.

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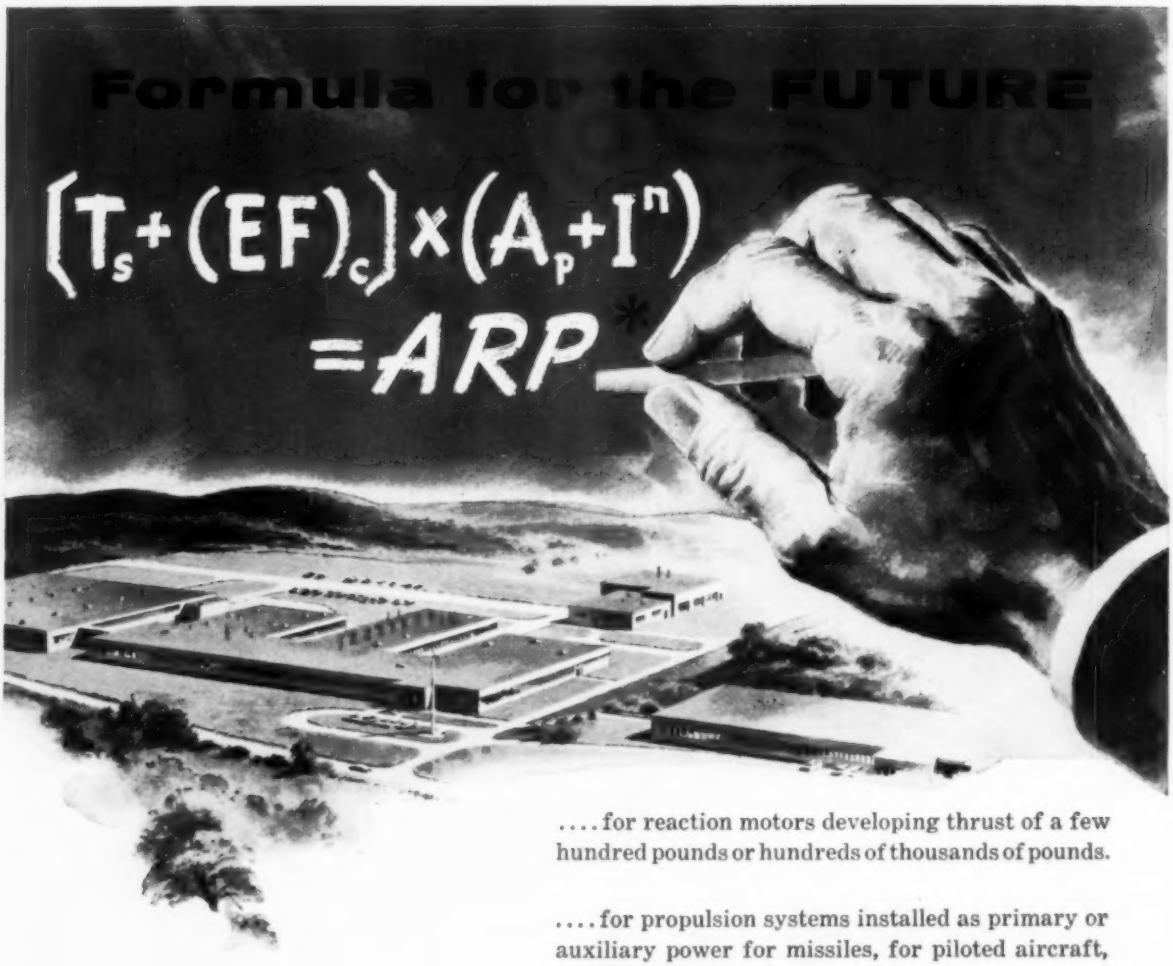
# Airline Traffic — March 1956

| | Revenue Passengers | Revenue Passenger Miles (000) | Load Factor | U. S. Mail | Express | Freight | Total Revenue Ton-Miles | Per Cent Revenue to Available Ton-Miles |
|---|---|---|---|---|---|---|---|---|
| **DOMESTIC TRUNK** | | | | | | | | |
| American | 590,752 | 355,514 | **67.63** | 1,770,069 | 935,920 | 5,365,583 | **42,936,573** | **60.26** |
| Braniff | 154,177 | 60,329 | **61.88** | 214,881 | 122,395 | 346,072 | **6,460,264** | **54.68** |
| Capital | 215,186 | 67,995 | **61.01** | 258,377 | 167,547 | 307,366 | **7,232,544** | **45.92** |
| Colonial | 31,298 | 7,950 | **58.41** | 15,268 | 6,011 | 29,684 | **810,478** | **59.82** |
| Continental | 58,589 | 20,933 | **54.64** | 71,962 | 28,165 | 110,157 | **2,218,539** | **46.88** |
| Delta | 207,784 | 103,617 | **68.91** | 327,105 | 238,612 | 601,817 | **11,149,542** | **62.52** |
| Eastern | 660,395 | 381,396 | **69.78** | 993,915 | 432,982 | 1,187,180 | **42,289,332** | **55.64** |
| National* | | | | | | | | |
| Northeast | 32,969 | 6,623 | **56.85** | 9,389 | 11,915 | 21,390 | **658,076** | **56.49** |
| Northwest | 101,272 | 61,391 | **57.52** | 392,969 | 222,828 | 571,244 | **7,326,833** | **51.67** |
| Trans World | 321,590 | 232,369 | **59.51** | 1,075,152 | 680,020 | 1,982,835 | **25,988,279** | **55.31** |
| United | 495,421 | 323,352 | **63.67** | 2,540,084 | 1,012,538 | 3,738,954 | **38,363,640** | **57.73** |
| Western | 18,893 | 9,043 | **61.62** | 53,003 | 15,399 | 30,120 | **961,602** | **55.86** |
| **INTERNATIONAL** | | | | | | | | |
| American | 12,164 | 9,114 | **79.61** | 12,716 | 554 | 254,573 | **1,235,048** | **79.64** |
| Braniff | 2,616 | 5,786 | **48.66** | 29,688 | | 102,859 | **1,467,012** | **53.55** |
| Caribbean Atlantic* | | | | | | | | |
| Colonial | 1,969 | 1,525 | **47.61** | 822 | | 4,055 | **170,910** | **52.10** |
| Delta | 4,968 | 5,067 | **56.21** | 8,513 | | 69,173 | **595,908** | **47.29** |
| Eastern | 16,198 | 22,433 | **64.27** | 68,000 | | 65,245 | **2,572,287** | **57.49** |
| National* | | | | | | | | |
| Northwest | 7,868 | 16,949 | **56.41** | 1,029,050 | 18,952 | 766,621 | **3,673,885** | **69.43** |
| Pan American | | | | | | | | |
| Alaska | 5,319 | 7,206 | **67.35** | 31,052 | | 262,119 | **1,064,843** | **53.61** |
| Atlantic | 71,835 | 83,466 | **63.37** | 1,061,732 | | 1,952,015 | **11,839,924** | **63.36** |
| Pacific | 23,093 | 66,843 | **73.77** | 1,146,480 | | 1,462,070 | **9,733,694** | **71.21** |
| Latin America | 102,426 | 83,395 | **63.63** | 350,680 | | 3,275,665 | **11,933,847** | **62.51** |
| Panagra | 12,599 | 15,497 | **63.31** | 54,651 | | 380,189 | **2,087,456** | **62.88** |
| Trans World | 19,270 | 49,584 | **59.81** | 855,193 | | 864,143 | **7,003,305** | **66.25** |
| United | 6,628 | 16,444 | **62.39** | 124,796 | | 55,149 | **1,882,994** | **59.34** |
| **LOCAL SERVICE** | | | | | | | | |
| Allegheny | 25,425 | 4,088 | **42.23** | 6,812 | 15,373 | 2,854 | **414,934** | **44.62** |
| Bonanza | 11,896 | 2,538 | **45.10** | 4,493 | 3,761 | 4,256 | **253,249** | **43.21** |
| Central | 10,261 | 1,713 | **34.43** | 3,854 | 2,619 | 5,073 | **175,090** | **30.79** |
| Frontier | 15,907 | 4,888 | **53.33** | 22,353 | 9,971 | 50,251 | **549,405** | **62.94** |
| Lake Central | 10,344 | 1,561 | **34.74** | 2,175 | 10,383 | | **157,614** | **34.13** |
| Mohawk | 24,328 | 4,355 | **56.02** | 3,913 | 7,672 | 9,784 | **436,427** | **56.15** |
| North Central | 38,457 | 5,679 | **48.69** | 18,694 | 27,641 | | **589,845** | **44.31** |
| Ozark | 24,483 | 3,671 | **35.24** | 9,412 | 14,819 | | **367,528** | **35.78** |
| Piedmont | 30,909 | 5,743 | **49.42** | 14,596 | 9,953 | 12,679 | **586,997** | **49.54** |
| Southern | 16,140 | 2,851 | **46.52** | 8,469 | 11,767 | | **293,343** | **44.17** |
| Southwest | 20,024 | 4,150 | **46.22** | 6,403 | 4,298 | 10,961 | **416,824** | **45.46** |
| Trans Texas | 17,718 | 3,997 | **39.38** | 13,065 | 8,240 | 19,279 | **421,653** | **36.35** |
| West Coast | 17,145 | 3,088 | **45.34** | 4,494 | 2,442 | 6,645 | **300,569** | **54.26** |
| **HAWAIIAN** | | | | | | | | |
| Hawaiian | 28,775 | 4,012 | **56.65** | 4,862 | | 124,992 | **487,755** | **51.69** |
| Trans Pacific | 13,191 | 1,666 | **47.83** | 804 | | 6,916 | **137,858** | **49.90** |
| **CARGO LINES** | | | | | | | | |
| Aerovias Sud Americana* | | | | | | | | |
| Flying Tiger | 3,260 | 11,647 | **98.82** | 26,705 | | 6,510,380 | **7,701,791** | **68.82** |
| Slick | 2,253 | 8,434 | **94.05** | 45,336 | | 4,975,981 | **5,864,735** | **78.08** |
| Riddle* | | | | | | | | |
| **HELICOPTER** | | | | | | | | |
| New York Airways | 2,545 | 46 | **50.00** | 1,003 | 1,108 | 431 | **6,836** | **56.54** |
| Los Angeles Airways | 1,296 | 62 | | 4,969 | 1,785 | | **11,775** | **52.15** |
| Helicopter Air Service | | | | 2,279 | | | **2,279** | **41.79** |
| **ALASKAN** | | | | | | | | |
| Alaska Airlines | 3,331 | 1,358 | **24.35** | 51,151 | | 400,880 | **606,736** | **39.75** |
| Alaska Coast | 2,573 | 268 | **52.86** | 3,822 | | 4,267 | **35,336** | **63.93** |
| Byers Airways* | | | | | | | | |
| Cordova | 1,379 | 232 | **57.86** | 2,902 | | 71,256 | **97,826** | **80.20** |
| Ellis Air Lines | 3,131 | 158 | **50.15** | 1,921 | | 1,986 | **19,993** | **62.70** |
| Northern Consolidated* | | | | | | | | |
| Pacific Northern | 6,009 | 4,558 | **45.78** | 61,261 | | 219,294 | **772,236** | **56.97** |
| Reeve Alaskan | 248 | 149 | **37.53** | 10,944 | | 9,404 | **36,851** | **57.30** |
| Wien Alaska | 1,683 | 816 | **16.76** | 33,806 | | 767,351 | **884,500** | **92.62** |

*Not available.
Compiled by AVIATION WEEK from airline reports to the Civil Aeronautics Board.

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# COCKPIT VIEWPOINT

By Capt. R. C. Robson

## A Bid for Realistic Schedules

On Wednesday the Civil Aeronautics Board will consider a proposal concerning "on time" operation of scheduled airline flights (AW April 23, p. 143). The measure, if adopted, would require all flights to arrive within five minutes of their published schedule at least 75% of the time. Flights of 1,000 miles and over would be given an additional leeway of 15 minutes.

There undoubtedly will be some opposition. Most people are never happy to see their movements restricted—even when it is for their own good. Others believe, however, that "on time" performance, whether as a result of legal requirements or otherwise, would be a blessing to the industry.

The Board states in its Draft Release No. 80: "It appears that many certified air carriers are currently publishing . . . flight schedules which do not accurately reflect their actual times of departure and arrival."

In other words, an airline can advertise any schedule it cares to, the only limit being how much—or how little—the public will swallow. An elapsed time of five hours could be printed for a flight requiring six hours—except that even the passengers might not be that gullible. Not that there actually are such extreme cases, but the practice of dropping minutes is not uncommon. And flights do exist in which on-time operation occurs as little as 10% of the time.

### Scheduling by Whim

Also, it can occasionally be found that a trip making several stops appears, when distance is divided by time, to vary greatly in speed. The answer is not that aircraft performance changes but rather that someone has simply ordained that it leave and arrive at a certain time and that's that.

So who gains? Not the passenger. People travel by air to save time, and they commute too often to be fooled consistently. Late arrivals merely antagonize them. It is doubtful if even the airline itself gains, for how can management plan ramp space, manpower utilization, cost of operation and so forth if its schedules are not honest?

Aside from passenger service, perhaps the most significant benefits of such a regulation lie in the field of improved traffic control and related facilities. Many surveys are made to determine the amount of traffic delays, and future planning is done around this information. But if the schedule can't even be made in VFR weather, then the statistics and planning may be wrong. By lengthening their schedules to conform with fact, the airlines might find a club to force improved traffic control.

### An Approach to Realism

Imagine, for instance, the hue and cry that would be raised if schedules for a normal one-hour trip became two hours; that supposedly 300 mph. airplanes showed up as only 150 mph. aircraft. And this might happen during certain months of the year. But it wouldn't happen for very long. The airlines, their stockholders and the public would soon understand that something was very wrong.

Realistic schedules might even tie in with things such as approach lights, runway turnoffs, taxiways etc. For instance, LaGuardia Airport handles a tremendous amount of traffic on Runway 31. But the one narrow taxiway leading to it is a bottleneck that causes untold delays when Number One aircraft has to wait for a clearance and holds up the entire operation.

So, while there may be opposition to this proposal, I'll bet the passengers would welcome realistic schedules, and, in the long run, even the airlines might come to appreciate the benefits. Pilots, of course, would be glad to see them, because the schedule is the basis of our day's work, rest and pay. An "on time" criteria seems a big step towards several goals. Regularity, as they say in the ads, is a good habit to develop.

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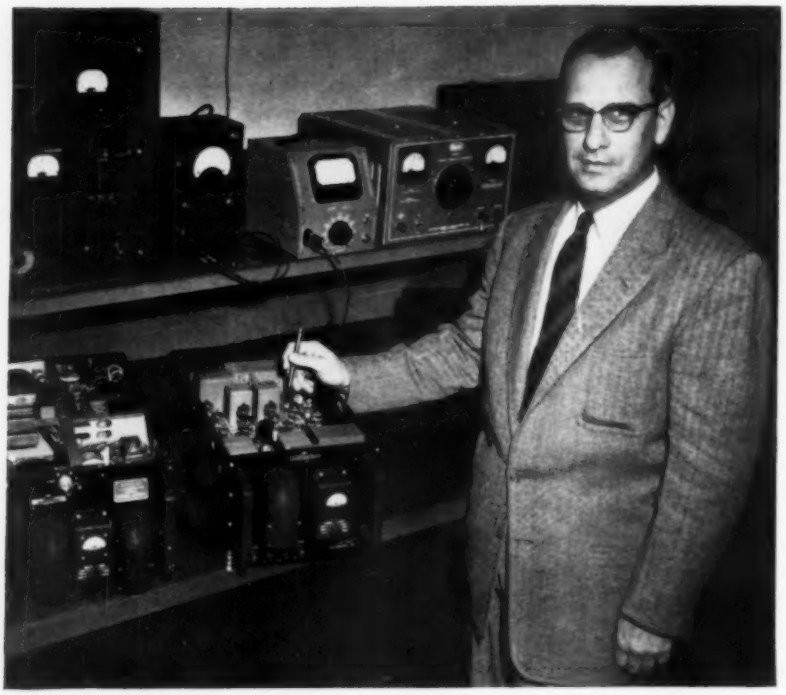

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181-1511

# Next Satellite Problem: Data Descent

By Robert Cushman

All the scientific knowledge from the U. S. satellites launched during the 18 month International Geophysical Year, July 1, 1957 to December 31, 1958, will be received via a radio telemetering link. At present it seems too difficult to bring a satellite back down through the atmosphere without its burning up.

After launching non-returnable satellites into orbits around the earth, the next U. S. effort will undoubtedly be to bring back physical evidence from space. The first returned cargo may only be a few ounces of matter exposed to satellite conditions. Later experiments will work slowly up from flies to monkeys. The end goal will be a manned satellite.

A plan to recover data from a future earth satellite by a stainless steel balloon has been proposed by Richard W. Porter, chairman of the U. S. Satellite Panel and General Electric consulting engineer.

Porter's approach is to rapidly slow the data capsule—carrying film in his example—with the drag of an stainless steel balloon as it enters the earth's upper atmosphere to prevent severe overheating. Once this prime re-entry crisis is over, the sphere is to "parachute" the film package down into the sea. It will float until spotted by search parties.

Porter has calculated that by using a 3 ft. diameter balloon a ½ lb. package of insulated film can be recovered. The film will have been exposed while in the orbit, then slipped into an insulating capsule.

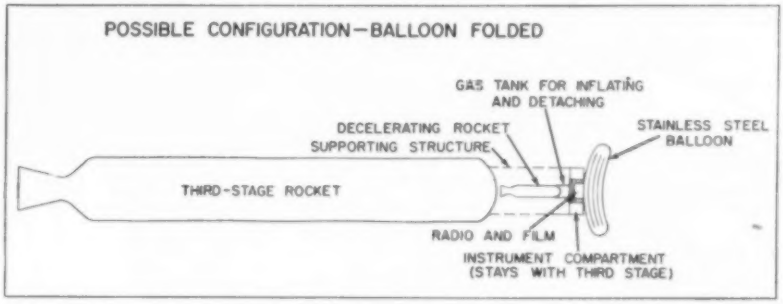


FIG. 1—Recovery balloon folds inside satellite section.

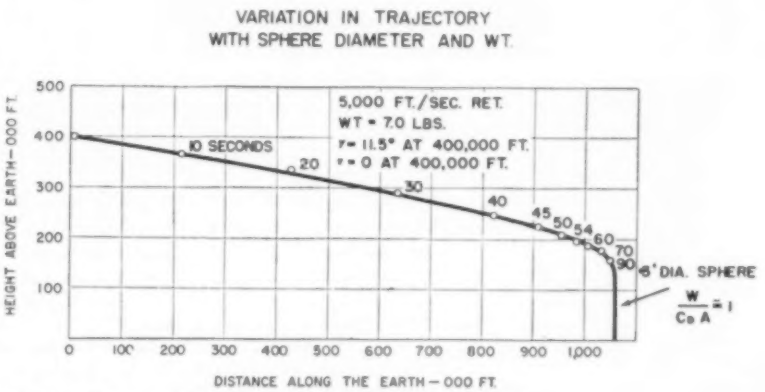


FIG. 2—Balloon descends vertically from 200,000 ft. altitude.

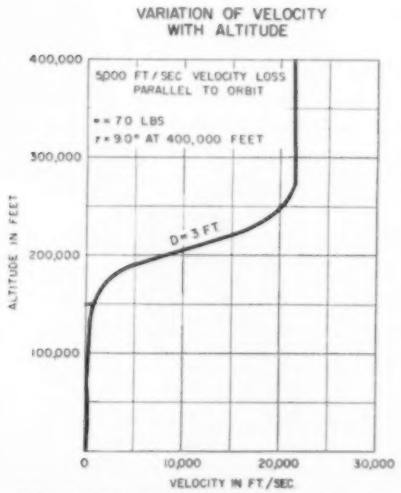


FIG. 3—Air resistance cuts descent rate.

The balloon folds up (Fig. 1) inside the vanguard's third stage along with the rest of the satellite. Weights chosen total less than the twenty-one pounds frequently quoted as the maximum allowable "all-up" weight of the satellite vehicle.

The 12 lb. retardation rocket and the 3.5 lb. balloon take up the lion's share of the satellite payload. All other items—the locating beacon transmitter, actuation receiver, gas to expand the balloon, structure and insulation, gas changing and detaching mechanism, film, film container, and camera or other device to expose the film—must stay within the remaining 5.5 lb.

This satellite will have to sacrifice all of the other forms of intelligence proposed for the IGY satellites in order to bring a small amount of exposed film to earth.

Because the spin stabilized satellite remains in fixed orientation while it orbits around the earth, the retardation rocket is aligned to slow the satellite down when it has traveled one hundred and eighty degrees of longitude and to the opposite side of the earth from Cape Canaveral, Florida, its starting point. If the recovery process is to start on the first satellite swing around the earth, the signal could be telemetered from Singapore for example. The balloon would bring the film down in the Pacific near the Philippines where the U. S. has facilities for radar tracking and sea search. Porter believes that if the original signal is accurately timed the final resting place of the balloon will be within a one-hundred mile radius.

If it is decided to orient the retarding rocket in the opposite direction to that shown in Fig. 1, recovery off Cape Canaveral would be possible. The same Air Force missile tracking range used in launching the satellites could be used in tracking the recovery.

The telemetered recovery signal will start the following chain of events:

• **Firing of the retardation rocket.** This has been sized to slow the satellite

## THE GPE CAPACITIES

| | I | II | III | IV | V | VI | VII | VIII | IX | X | XI | XII | XIII | XIV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Precision Mechanics, Optical Devices, Ceramics | ●●● | ●● | ●● | □●● | ●● | ●●● | | ●● | ●●● | □●● | ●● | ●● | ●● | ●●● |
| Electrical Equipment and Components | ●●● | ● | ● | | | ●●● | | ●●● | ●● | □●● | ● | ●● | ● | ●●● |
| Electronics | ●●● | ●● | ●●● | ●●● | | ●●● | | ● | ●● | □●● | | ●●● | ●● | ●●● |
| Hydraulics, Liquids Processing, Heat Exchange | | ●● | | | ●●● | | ●●● | | | | | ●●● | | |
| Television: Studio, Theatre, Institutional, Business, Industrial | ● | ● | | ●●● | | ● | | | | | | ● | | |
| Instruments, Servos, Controls: Hydraulic, Pneumatic, Magnetic, Electronic | ●●● | ● | ●● | □●● | | ●●● | ●●● | ●● | ●● | □●● | | ●●● | ● | ●●● |
| Aircraft and Missile Guidance, Control, Simulation | ●●● | ● | | ●●● | | ●●● | | ● | | | | ●● | ● | ●●● |
| Automatic Computers and Components | ●●● | ● | ● | □●● | | ●●● | | | | | | ●●● | | ●●● |
| Radar, Microwave, Ultrasonics | ●●● | ● | ●● | ●●● | | ●● | | | ● | □●● | | ● | | |
| Motion Picture and Audio Equipment | | ●●● | | □●● | | | | ●● | ●●● | | ●●● | | ●●● | |
| Nuclear Power Components and Controls | ●●● | | | | ●● | | | | | □●● | | ●● | | ●●● |
| Systems Engineering: Aeronautical, Naval, Industrial | ●●● | | | ●●● | ●●● | ●●● | ●●● | | | □●● | | ●●● | | ●●● |

I Kearfott Company, Inc.; Little Falls, New Jersey
II International Projector Corporation; Bloomfield, New Jersey
III Bludworth Marine; New York
IV General Precision Laboratory Incorporated; Pleasantville, New York
V The Griscom-Russell Company; Massillon, Ohio
VI Link Aviation, Inc.; Binghamton, New York
VII Shand and Jurs Co.; Berkeley, California
VIII The Hertner Electric Company; Cleveland
IX The Strong Electric Corporation; Toledo, Ohio
X Precision Technology, Inc.; Livermore, California
XI J. E. McAuley Mfg. Co.; Chicago
XII Askania Regulator Company; Chicago
XIII Ampro Corporation; Chicago
XIV Librascope, Incorporated; Glendale, California

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# to "speak softly..."

More than a year ago, one of the operating companies of General Precision Equipment Corporation—after nearly 8 years of joint development work with the Air Force—placed in scheduled production the most advanced air navigation system known to exist. Called AN/APN-66, the system is based on "Doppler effect," a known natural phenomenon, but one which others said could never be applied to aviation engineering. Its successful development brought to culmination still another notable aviation engineering "first" by a GPE Company.

AN/APN-66 and related systems adapted for specific purposes compute air position with unprecedented accuracy and speed. They work independently of any ground-based reference, optical or electronic; are the only operational systems that are global. They provide a vitally needed element in the defensive-offensive power our country must have to speak softly, yet negotiate from strength.

For months now, these systems have been functioning as brain and nerve center in a substantial number of the Air Force's newest craft. In millions of miles of operational flight they have demonstrated their engineering genius. When put to civilian use, they will guide air liners to the remote corners of the globe with equal accuracy. Then, never again need a plane get lost anywhere...in any weather.

While the GPE Company primarily responsible for this AN/APN equipment is General Precision Laboratory, the systems are typical products of GPE Coordinated Precision Technology. Four other GPE Companies—Askania, International Projector, Kearfott and Librascope—participated with GPL in providing the components that made them possible. All now manufacture portions of the equipment.

As the chart on the opposite page shows, all of the producing companies in the GPE Group work in highly advanced fields. GPE Coordinated Precision Technology, a basic GPE operating policy, gives each GPE company access to the skills and facilities of the others and coordinates those which are relevant. This coordination has played an important part in amplifying the capabilities of all GPE companies, enabling them to solve highly advanced technological problems with vision. Frequently, as with these AN/APN systems, frontiers of science are pushed back on the way.

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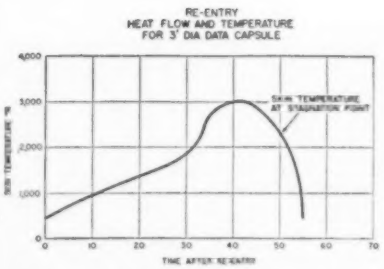


**FIG. 4—High heat for 20 sec.**

down from its orbital velocity of 25,000 fps. to 20,000 fps.

- **Inflating** of the stainless steel sphere with helium from the storage bottle.
- **Detaching sphere** from the inflating mechanism and retardation rocket.

No longer able to counteract the earth's gravitational pull the satellite will fall out of its orbit.

The recovery vehicle falls out of the orbit in an ellipse until it reaches the earth's atmosphere. Here at 400,000 ft. (76 miles), the most critical phase of the recovery begins. Fig. 2 shows the trajectory of the balloon after it has entered the earth's atmosphere. In Fig. 3, it slows up when it hits the denser air below 200,000 ft. above the earth. Fig. 4 shows how it heats up for the same reason.

Note, however, by cross checking the times and altitudes of the three graphs, that the balloon heats up first then slows up. Maximum temperature is reached about 40 sec. after re-entry, but maximum rate of deceleration is not reached until some 10 sec. later.

If it is able to survive this "bath of fire" the balloon "parachutes" down in the customary manner to drop into the sea with a conservative terminal velocity of 30 fps. slightly over 20 minutes after being forced out of its orbit.

The major problem, other than meteorite bombardment which will be mentioned later, is the severe heating before the balloon slows down. As Fig. 4 indicates, the temperature at the stagnation point goes up to the melting point of stainless steel. Nevertheless, Porter feels that three factors will act to save the balloon from evaporating away as do all other objects this size which enter our atmosphere from space. One is the aerodynamic instability of the balloon which will cause it to wobble about, spreading the high local temperature of the stagnation point over the forward half of the balloon. The second is the thin exterior coating of Teflon. Third, the insulated film pack acting as ballast, will lead the balloon and will take some of the brunt of heating.

Porter's past bumper experience leads him to believe that Teflon further re-

enforced with quartz fibers will form a heat sink and protect the film even though some layers of quartz-Teflon are boiled away before the recovery vehicle slows down.

Meteorite damage, says Fred L. Whipple, director of the Smithsonian Astrophysical Observatory, may be the Achilles heel of this approach. The danger of puncture by tiny space meteorites, as yet unmeasured, could very well destroy the balloon before it sinks below the protective layer of the earth's atmosphere. Porter, while admitting the possibility, counters this objection by reasoning that the balloon might still function to some degree even though peppered by space dust. It could still provide aerodynamic drag despite a certain amount of small holes. He agrees that this is an important "if."

"How would you go about making a foldable stainless steel balloon?" asks Wolfgang Klemperer, Douglas Aircraft Corporation. Although his experience with rockets has convinced him of the value of photographs returned from high altitudes, he is not sure that it would be at all easy to make a stainless steel balloon. Porter admits that fabricating the balloon would be the first practical step. He has envisioned the .003 in. stainless steel balloon, coated with a .001 in. layer of Teflon on the inside and the heat protective layer of Teflon on the outside. He hopes that it will be possible to fold this over on itself to one-eighth of original size.

Krafft A. Ehricke, Convair, favors a winged re-entry vehicle which uses aerodynamic lift rather than drag to slow itself down. The problem here is that the flight must be stable and controlled.

Re-entry analyses are pertinent because they deal with problems which must be solved before we can have manned space travel and they cover areas parallel to those of the high-altitude, hypersonic fighters to come.

## Heavy Press Operations Begin in Buffalo and Calif.

Production operation of a 12,000-ton horizontal steel extrusion press has begun at Curtiss Wright's metal Processing Division, Buffalo, N. Y. Approximately $250,000 worth of extrusions were shipped by the plant during March including items of alloy and stainless steels, titanium and vacuum-melted alloys. Over $4 million in additional production is planned for this year. The Loewy press has a capacity of over $20 million worth of extrusions annually.

Operation of 8,000-ton hydraulic forging press has begun at Aluminum Company of America's Vernon, Calif., plant. The press was built by Schloemann, A. G., Dusseldorf, Germany.

# Filter Tests Show Important Savings

1,200-hour flight tests of Winslow filters on R-4360 engines by Pan American World Airways indicate savings of hundreds of dollars per engine, for replacement parts and labor.

During the tests, at 901:46 T.S.O., a piston failed in a filter-equipped engine. Because the Winslow CP* full-flow filter picked up the metal particles, cost of repairs was only $315.39—the average cost for piston failure on eight other engines was $1,935 per engine.

Winslow has CAA-approved full-flow filters for most aircraft engines. For engineering data and recommendations for your equipment, please write: Aviation Department, Winslow Engineering Company, 4069 Hollis Street, Oakland 8, California.

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AV-56-1

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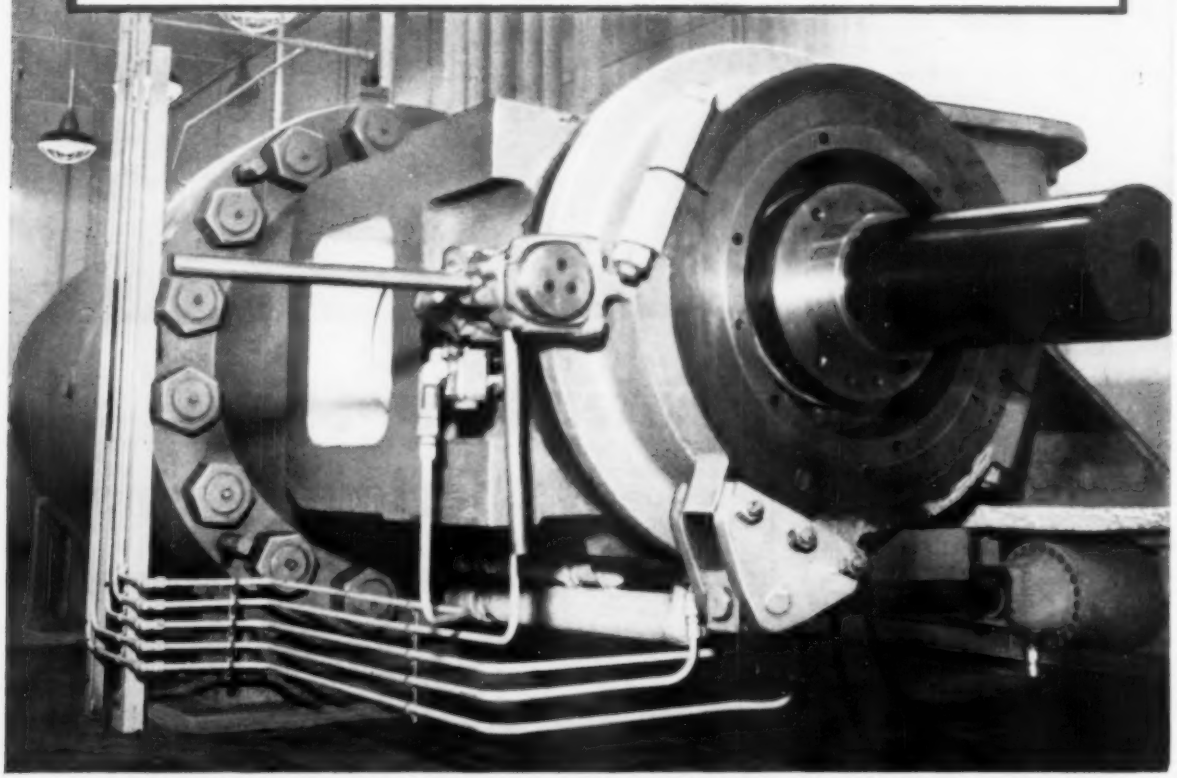

*Solid rocket fuel emerges from one of many extruders at Air Force Plant 66, McGregor, Texas*

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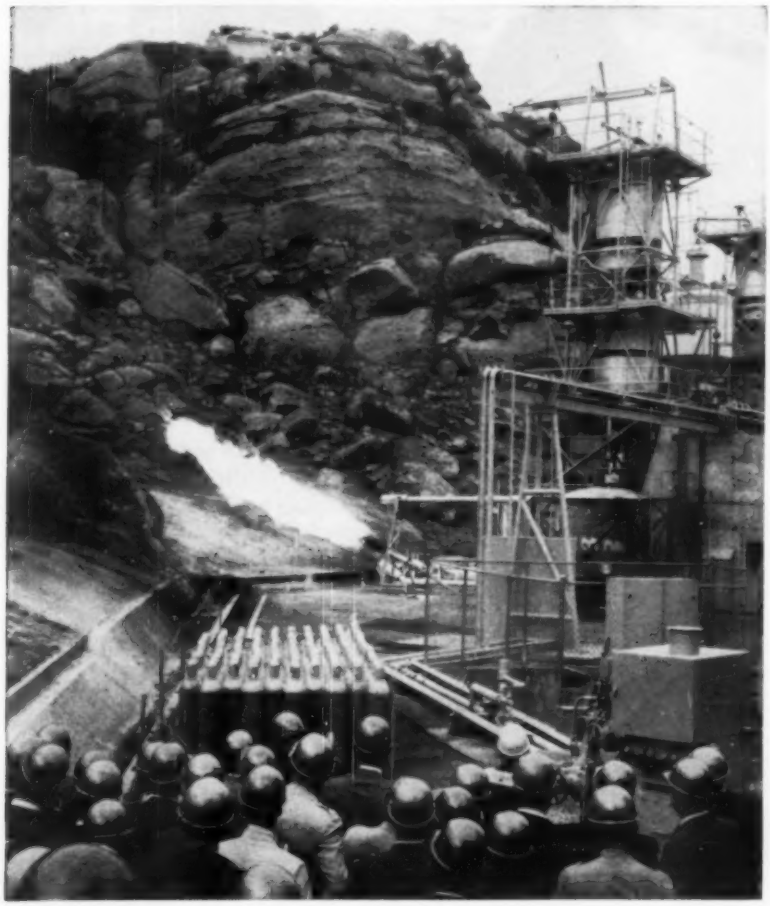
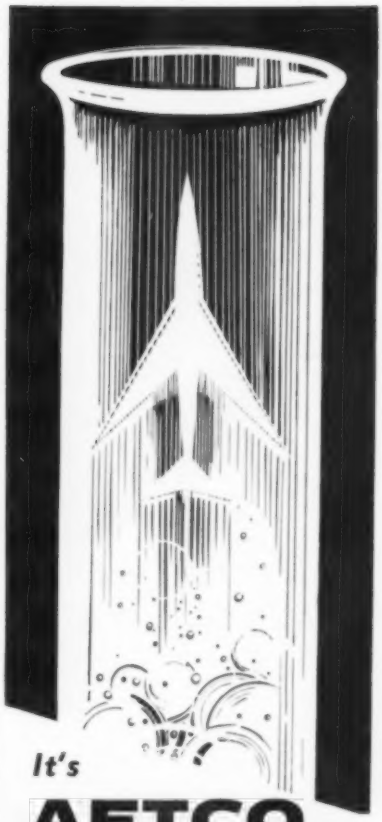
## Convair Fires Atlas ICBM Engine

Cloud of dust blows up (above) at a test firing of the 135,000-lb.-thrust sustaining chamber of an Atlas ICBM powerplant at Santa Susana Field Propulsion Laboratory of North American Aviation's Rocketdyne Division (AW Apr. 23, p. 37). Noisy exhaust from gas generator is fired off below. The generator is a very important turbopump component of rocket engine. When installed in rocket engine, the generator exhaust is discharged into main-chamber stream, does not ignite separately.



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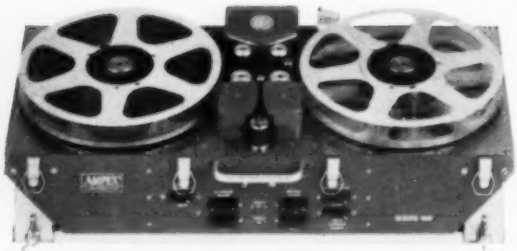

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Texas University
Bell Telephone Labs
Federal Telecommunications Labs
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This installation of an Ampex 800 Airborne Magnetic Recorder in an F-80 at Edwards Airforce Base is at the heart of a major project for developing faster data recording and reduction techniques. Over twenty aircraft companies, government test facilities and others have also purchased Ampex 800s and received delivery in quantity during its first year of production.

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# Test Pilots Organize Scientific Society

**Los Angeles**—Patterned after the Institute of the Aeronautical Sciences and chartered as a non-profit educational corporation, the Society of Experimental Test Pilots held its first open meeting here recently. Highlighting the meeting were outlines by the chairmen, of the aims of the committees on:

• **Flight equipment and escape.** Headed by Thomas Kilgariff, Douglas, the committee membership embraces all concerns connected with experimental flight test and hopes to spread among society members, all the latest and best information on pilot protection and escape. As in all committees, security and company proprietary interest are to be observed.

• **Flight test techniques.** The group, headed by Scott Crossfield, North American Aviation, and Robert Rahn, Douglas, hopes to compile and disseminate experiences of society members regarding general airplane tendencies at high Mach numbers. Another goal is compilation of a stability and control reference to serve the military services and company engineers on requirements for future airplanes.

• **Aeronautical development.** Increasing the pilot's professional status and providing information in this field are the goals. The committee is headed by Joseph Tyczyszyn, Civil Aeronautics Administration, who outlined five fields of effort as: flight control systems, powerplant systems, equipment, in the machinery sense rather than personal, ideas and things, covering items not covered elsewhere, and aircraft projects.

• **Membership,** with Rahn as chairman, which has set up classifications for members, corporate members, associate members, fellows and associate fellows. Now-active experimental test pilots will be members and fellows (the latter a higher grade of member, one who has made an outstanding contribution to aeronautical science). Experimental test pilots, who have advanced in company structure to administrative posts, will also be members and fellows. Corporate memberships are for companies, which can deduct their contributions to the society for tax purposes under the type charter granted the organization. Associate members will be former test pilots, production test pilots and military pilots. Associate member and associate fellow both will be degrees of membership from which men can step up to member and fellow. Associate fellow will be for associate members ineligible for regular member status.

• **Operational coordination,** which has Charles Tucker, Lockheed, as chairman. The problem of airspace utilization over

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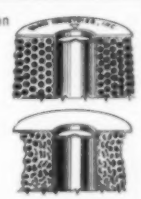
Cross section of "Soft-Wound" spool

Cross section of ordinary spool



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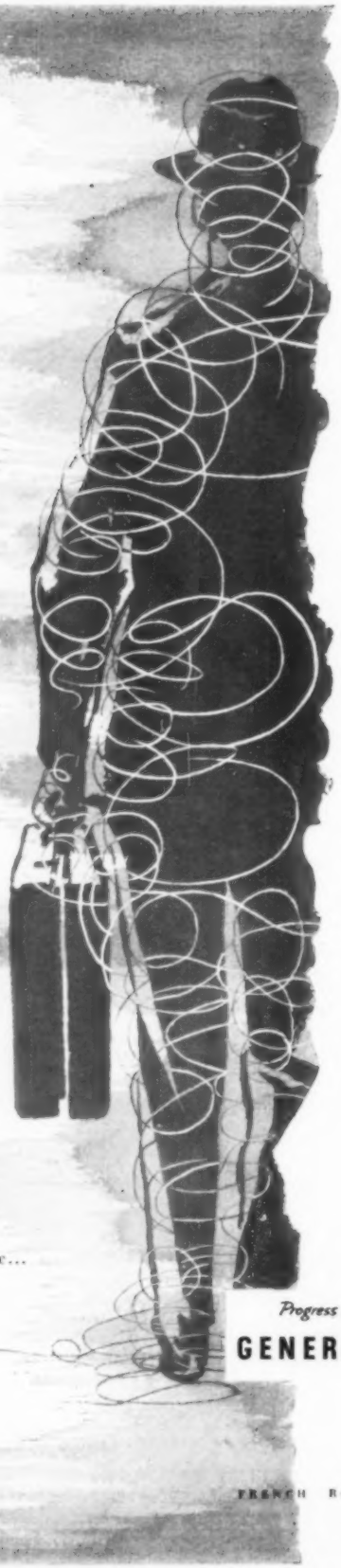

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the desert area in society members work Palmdale, Edwards flight test center), has become critical in view of the high Mach numbers being flown, and the committee hopes to set up standard using procedures for all bases in the area. Another goal is standardization of and development of a master plan for air-sea rescue of downed pilots. Presence of Naval Ordnance Test Station, Invokern, and Marine Air Station, Mojave, also within the test centers' area, makes more equipment available for this activity, but so far each base goes about ASR on its own plan.

- **Organizational,** headed by Ray Tenhoff, Northrop.
- **Steering,** headed by Tenhoff and Joseph Ozier, Lockheed, as co-chairmen.
- **Legal,** chairmanned by Al Blackburn, North American Aviation, which formulated the society's charter under California law to provide for the tax-free status.

First meetings started six months ago with Tenhoff, Ozier, Rahn and Richard Johnson and John Fitzpatrick of Convair as nucleus. First suggestion of such a group was Tenhoff's, who proposed it to Ozier, Rahn and others.

Charter membership was 67 pilots from all fields concerned in experimental test flying at Palmdale and Edwards test bases. Of these, 28 hold engineering degrees and seven hold degrees in other fields. Four have masters degrees in aeronautical engineering. They average 6.3 years experimental test flying.

Sixty have military backgrounds, averaging four years service as pilots. At least half are graduates of Navy or Air Force test pilots schools.

Their average number of years as pilots is 12, while the average age is in the early 30s. Total flight time varies widely, according to whether a man served as a transport pilot or started test work soon after learning to fly. The large majority are married, with families.

Current chairman is Tenhoff, with Ozier as secretary and Cal Shoemaker of Douglas as treasurer. Officers, when elected, will be president, vice president, secretary, treasurer, security officer and a seven-man board of directors. Voting on general matters will be open to members and associate members, while voting on matters affecting the society internally will be open to members only.

## DC-8 Electrical Systems Ordered from Jack & Heintz

Douglas Aircraft contracted with Jack & Heintz for $500,000 worth of complete A.C. electric systems for the DC-8. Another order exceeding $450,000 for A.C. systems for the Convair F-102, bringing the total for this plane to over $3 million, was placed by USAF.


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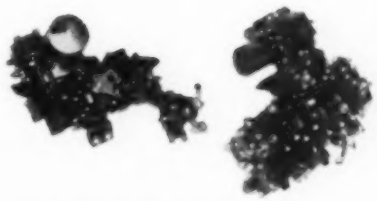

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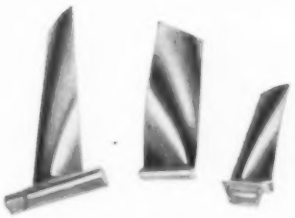

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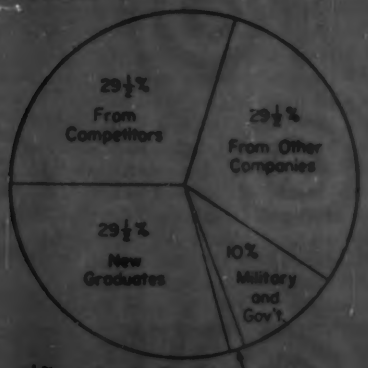
# AVIONICS

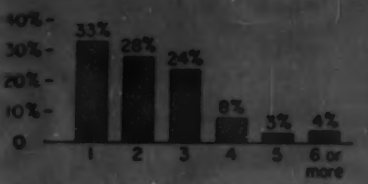
**SOURCES OF ENGINEERS HIRED**




**DEMAND FOR AVIONICS ENGINEERS**

| How does supply of Avionics engineers today compare with a year ago? | Replies of ALL companies | East Coast companies | Mid-west companies | West Coast companies |
|---|---|---|---|---|
| Very much tighter | 9 | 4 | 0 | 5 |
| Tighter | 3 | 2 | 1 | 0 |
| About the same | 7 | 4 | 2 | 1 |
| Easier | 0 | 0 | 0 | 0 |

Based on appraisal by 19 major Avionics suppliers.




Number of jobs held by avionics engineers surveyed as a percentage of total number polled.

# Why Engineers Change Jobs: More Money,

By Philip J. Klass

**Last year 15 percent of the engineers employed in the avionics industry quit old jobs to take new ones. For every three engineers and scientists which the avionics companies hired, they lost one.**

**Higher salary and the opportunity for greater responsibility are the two major reasons why engineers leave. These outweigh all other factors combined. Geographical consideration is third.**

These are some of the facts revealed by an AVIATION WEEK survey of 18 major avionics suppliers whose employes represent 25 to 40% of the avionics industry total. This was supplemented by a simultaneous survey of 200 avionics engineers selected at random from an Institute of Radio Engineers directory.

Avionics companies surveyed ranged in size from small to large—one employs 2,400 engineers, another only 20. Jointly, they employ 11,700 engineers and scientists. During the past year this group of avionics companies:

- **Hired** a total of 3,700 engineers.
- **Lost** a total of 1,400 engineers.
- **Showed net gain** of 2,300 engineers, representing approximately a 24% net increase in the size of their engineering staffs. (Figures used above and elsewhere in this report have been rounded off for convenience.)

To encourage companies to report their engineering staff gains and losses with complete candor, AVIATION WEEK assured them that individual company figures would not be revealed. Of 24 suppliers which received survey questionnaires, only five declined to participate, with one more declining to provide some of the information requested.

## Reporting Bias

If any bias exists in the figures, it would be natural to assume that companies overstated the number of engineers hired and understated the number lost. However, two of the 18 full returns revealed that the companies had lost more engineers than they had hired in the past year.

The number of engineers hired during the past year by individual companies surveyed ranged from 2 to nearly 900. Net changes in engineering manpower in terms of percentage of staff at the start of the previous year, ranged from a 5% loss to 78% gain.

AVIATION WEEK's questionnaire asked companies to indicate the percentage of new engineers which they hired from each of five sources. A summary of returns shows:

- **Competitors:** 29½%, or 1,100 engineers
- **Other Companies:** 29½%, or 1,100 engineers
- **New Graduates:** 29½%, or 1,100 engineers
- **Military & Government:** 10%, or 350 engineers
- **University Faculties:** 1½%, or 50 engineers.

Despite the identical summary figures for competitors, other companies, and new graduates, individual company survey returns showed a wide variation between the three sources.

The companies indicate that they need an additional 3,400 engineers to completely satisfy their present requirements. This would represent a 29% increase of their present engineering employment. On the assumption that the firms surveyed employ about 25 to 40% of the total avionics industry manpower, this would indicate an industry wide need for 8,500 to 13,600 more engineers.

## Job Motivations

What motivates an engineer to take a new job?

Names of 300 engineers were selected from the 1955 directory of IRE members on a random basis except that

## RATING OF FACTORS WHICH MOTIVATED ENGINEERS TO TAKE PRESENT JOB*

| Years in the Profession | 0-2 | 2-4 | 4-6 | 6-8 | 8-10 | 10-15 | 15-20 | Over 20 | Overall |
|---|---|---|---|---|---|---|---|---|---|
| Higher Salary | 24% | 36% | 32% | 29% | 23% | 29% | 28% | 16% | 29% |
| Greater Responsibility | 22% | 4% | 17% | 29% | 34% | 35% | 36% | 42% | 27% |
| Geographical Considerations | 5% | 19% | 25% | 22% | 19% | 11% | 15% | 24% | 19% |
| Educational Opportunities | 28% | 22% | 6% | 1% | 4% | 4% | 3% | 0 | 6% |
| Larger Company | 8% | 5% | 6% | 4% | 6% | 9% | 7% | 3% | 6% |
| Smaller Company | 0 | 7% | 8% | 5% | 11% | 0 | 1% | 5% | 5% |
| **Company Reputation and Policies | 0 | 3% | 2% | 2% | 2% | 4% | 3% | 7% | 3% |
| **Type of Work | 8% | 0 | 2% | 6% | 0 | 3% | 7% | 0% | 3% |
| Name Scientists | 5% | 4% | 2% | 2% | 1% | 5% | 0 | 3% | 2% |
| | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |

* Based on using only first, second and third choices, and weighting them three, two and one respectively.

** Write-in votes for motivation factors not included in survey form.

## ENGINEER AND COMPANY RATINGS OF JOB MOTIVATION FACTORS

| | Relative Position | | Percent of Total Vote* | |
|---|---|---|---|---|
| | Engineers | Companies | Engineers | Companies |
| Higher Salary | 1 | 3 | 29% | 15% |
| Opportunity for Greater Responsibility | 2 | 1 | 27% | 29% |
| Geographical Considerations | 3 | 2 | 19% | 18% |
| Opportunity for Advanced Studies | 4-5 | 5-6 | 6% | 8% |
| To Work for Larger Company | 4-5 | 8-9 | 6% | 3% |
| To Work for Smaller Company | 6 | 4 | 5% | 9% |
| **Company Reputation & Policies | 7-8 | 7 | 3% | 6% |
| **Interesting Work or Type Work | 7-8 | 5-6 | 3% | 9% |
| To Work with "Name Scientists" | 9 | 8-9 | 2% | 3% |

* Based on using only first, second, and third choices, and weighting them three, two, and one, respectively.

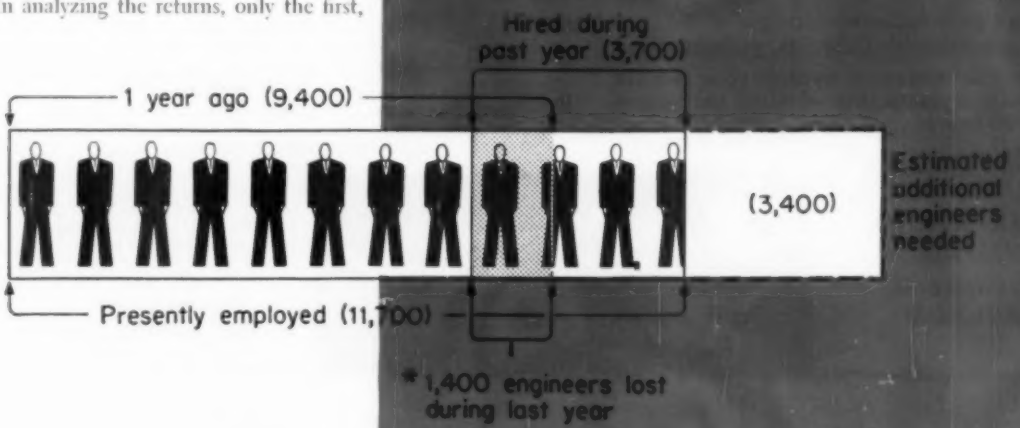
** Write-in votes for motivation factors not included in survey form.

# Responsibility

only engineers working for companies known to be active in the avionics field were used. Some names were selected for engineers working at government avionics facilities, such as Rome or Wright Air Development Centers.

Of the 500 questionnaires sent out, approximately 25 were returned marked: "No longer here," an indication that at least 8% of the engineers had changed jobs during the past year.

AVIATION WEEK asked the engineers: "What motivations prompted you to take your present position," and then listed seven possible reasons, with blank spaces available for listing others. Engineers were asked to rate motivations in numerical order of importance. In analyzing the returns, only the first,



# NEW Bendix MARKER RECEIVER

(¼ ATR)

## *Compact...Rugged...Weighs only 8½ pounds!*

Now from Bendix*, makers of the world's standard in Marker-Receivers, comes a big advancement—the MKA-7A. Completely new from chassis to case, the Bendix MKA-7A Marker-Receiver is designed for dependable, trouble-free reception of signals from airways fan markers, station locator Z markers and ILS approach markers.

Smaller in size, lighter in weight, it is scheduled for use in Pan American Airways new fleet of DC-7C's.

Operating on a fixed frequency of 75 megacycles, the MKA-7A features improved circuitry that performs a two-fold function:

(1) Greatly reduces the chance of television or FM interference.

(2) Stabilizes gain under wide ranges of environmental conditions and line voltage fluctuations.

For further information, contact your Bendix Aviation Radio representative or write the factory direct. Address below.

*Reg. U. S. Pat. Off.

### SPECIFICATIONS

| | |
|---|---|
| Antenna transmission line input impedance | 52 ohms. Voltage standing wave ratio less than 1.2 to 1. |
| AVC characteristics | Audio output is within a 6-db range at r-f input levels from 400 to 200,000 microvolts. |
| Selectivity | Attenuation — Total Bandwidth<br>6 db — more than 40 kc<br>60 db — less than 250 kc |
| Frequency stability | ± 10 kc under all service conditions. |
| Undesired response rejection | Interference from adjacent channel television signals will not produce lamp threshold at input levels up to 3.5 volts. |
| Audio output impedance | 500 ohms, nominal. |
| Power requirements | *AC Power Supply*<br>115 volts ac, 300-1000 cps, 35 VA with 27.5 volts dc for ON-OFF relay control.<br>or<br>*DC Power Supply*<br>27.5 volts dc, 36 watts. |
| Altitude performance | Operates at barometric pressures equivalent to 30,000 feet altitude. |
| Ambient temperature rating | −40°C to +70°C (−40°F to +158°F). |

*Specifications subject to change without notice.*

**BENDIX RADIO DIVISION**
**BALTIMORE 4, MARYLAND**

Bendix AVIATION Radio

Bendix AVIATION CORPORATION

West Coast Sales:
10500 Magnolia Blvd.
North Hollywood, California

Export Sales and Service:
Bendix International Division
205 E. 42nd St., N. Y. 17
N. Y., U.S.A.

Canadian Distributor:
Aviation Electric
200 Laurentian Boulevard
Montreal, Quebec

second, and third choices were used, and assigned weighting factors of three, two, and one, respectively.

Here is the way the engineers rated the seven motivations, together with two other factors which received a sufficient number of write-ins to be included in the totals:

- **Higher salary:** 29% of "total vote"
- **Greater Responsibility:** 27%
- **Geographical Considerations:** 19%
- **Opportunity for Advanced Study:** 6%
- **Work for Larger Company:** 6%
- **Work for Smaller Company:** 5%
- *Company Reputation & Policies: 3%
- *Interesting Type Work: 3%
- **Work with "Name Scientists":** 2%

The two categories shown with asterisks (*) were "write-in" motivations. If they had been listed along with the others, it is possible that they might have rated higher, although this is entirely speculation.

Analysis of the 200 questionnaires returned reveals the following in terms of the number of years spent in the profession:

| Percent of total polled | NO. of years in profession |
|---|---|
| 5% | 0-2 yrs. |
| 7% | 2-4 yrs. |
| 26% | 4-6 yrs. |
| 18% | 6-8 yrs. |
| 13% | 8-10 yrs. |
| 15% | 10-15 yrs. |
| 10% | 15-20 yrs. |
| 5% | Over 20 yrs. |

(NOTE: Military service not included.)

The sample surveyed had spent an average of 9.2 years in the profession, and had held an average of 2.3 jobs during that time, or an average of 4 years per job. A detailed breakdown reveals the number of jobs held:

- **One job:** 33%
- **Two jobs:** 28%
- **Three jobs:** 24%
- **Four jobs:** 8%
- **Five jobs:** 3%
- **Six or more jobs:** 4%

Company ratings of motivation factors, using the identical question form,


# *New* 2-TERMINAL

**SERIES L-6600**

Only $1\frac{15}{64}$" long from lens to terminals, this new Hetherington light gives wide-angle visibility in both standard and edge-lit panels. Uses 6, 14 or 28 volt AN-3140 lamps in a unique mounting so light is "piped" evenly throughout the long plastic lens. Lamp circuit insulated from case to meet the needs of electronic equipment. Mounts in $\frac{15}{32}$" diameter hole. Can be supplied with "taper tab" terminals. Also available with l-terminal, case ground, as Series L-6000.

2 *smaller*

# INDICATOR LIGHTS

***for compact Aviation and Industrial Assemblies***

# *New* "PRESS-TO-TEST"

**SERIES L-3200**

Here's added safety for critical warning light jobs. Lamp and its circuit can be "checked out" before take-off by pressing spring-mounted plastic lens cap. Uses same lamps and lens assembly as L-6600 shown above. Lamp circuits insulated from case. Housed in lightweight anodized aluminum case. Mounts in $\frac{1}{2}$" diameter hole.

**OTHER** INDICATOR LIGHTS . . . including Hetherington-originated switches with Built-in Lights are regularly produced in a variety of standard and special styles. *Write for Bulletin L-2.*

**HETHERINGTON, Inc.**

**SHARON HILL, PA.**

*West Coast Div.:*
139 Illinois St.
El Segundo, Calif.

**HETHERINGTON**

INDICATOR LIGHTS • SNAP-ACTION SWITCHES
SWITCHES WITH BUILT-IN LIGHTS
HIGH-IMPACT RELAYS • COILS • SOLENOIDS

Direct readings of

**FREQUENCY**

**TIME**

**PERIOD**

## New hp 523B ELECTRONIC COUNTER

# 10 cps to 1.1 MC!

- **Extreme dependability**
- **Etched, unitized circuits**
- **Permits viewing time-interval start and stop points on oscilloscope**
- **High accuracy crystal oscillator circuit**
- **Trouble-localizer lights**
- **Counts pulses of selected voltage level**

Construction of the new *-hp-* 523B is highest quality throughout. Etched circuits are rugged, ultra-dependable. Circuits are arranged for complete visibility. Trouble-localizer lights and plugs disconnecting circuit elements further simplify maintenance.

Exclusive features include a pulse output for oscilloscope Z-axis modulation permitting visual identification of the time-interval start and stop points on the input waveform measured. There is also a pulse count discriminator counting only pulses of voltage above a pre-determined level; and a high accuracy, high stability crystal controlled oscillator. Controls are color-coded, concentric, functionally arranged. Readings are direct in clear, bright numerals; decimal is automatic and illuminated.

The broad range and versatile usefulness of *-hp-* 523B is indicated by the Specifications at right. Model 523B is designed for utmost speed and simplicity in measuring production quantities, rpm, nuclear pulses, power line frequencies, repetition rates, time intervals, pulse lengths, shutter speeds, velocities, relay times, frequency ratios, phase delay, etc. With transducers, *-hp-* 523B also provides local or remote measurement of weight, pressure, temperature, acceleration, etc.

### BRIEF SPECIFICATIONS

| | |
|---|---|
| **FREQUENCY MEASUREMENT:** | |
| Range: | 10 cps to 1.1 MC |
| Accuracy: | ± 1 count ± crystal stability |
| Input Minimum: | 0.2 v RMS |
| Input Impedance: | Approx. 1 megohm, 30 μμf shunt |
| Gate Time: | 0.001, 0.01, 0.1, 1, 10 seconds |
| Reads Directly In: | KC. Automatic decimal |
| **PERIOD MEASUREMENT:** | |
| Range: | 0.00001 cps to 10 KC |
| Accuracy: | ±0.3% (1 period); ±0.03% (10 periods) |
| Input Minimum: | 1 v RMS |
| Input Impedance: | Approx. 1 megohm, 40 μμf shunt |
| Gate Time: | 1 or 10 cycles of unknown |
| Standard Counting: | 10 cps, 1 KC, 100 KC, 1 MC, External |
| Reads Directly In: | Sec, msec, μsec; automatic decimal |
| **TIME INTERVAL MEASUREMENT:** | |
| Range: | 3.0 μsec to 100,000 sec (27.8 hrs) |
| Accuracy: | ±1/ std. freq. counted ± stability |
| Input Minimum: | 1 v peak. dc coupled |
| Input Impedance: | Approx. 1 megohm, 25 μμf shunt |
| Trigger Slope: | Pos. or neg. on start/stop independent or common channels |
| Trigger Amplitude: | −300 to +300 v adjustable |
| Standard Counting: | 10 cps, 1 KC, 100 KC, 1 MC, External |
| Reads Directly In: | Sec, msec, μsec, automatic decimal |
| **STABILITY:** | 2/1,000,000 per week. Also WWV |
| **DISPLAY TIME:** | Variable 0.1 to 5 sec, or indefinite |
| **OUTPUTS:** | Secondary standard: 10 cps, 1 KC rectangular, 100 KC, 1 MC sine wave. |
| **PRICE:** | $1,175.00 |

*Data subject to change without notice. Price f.o.b. factory.*

**HEWLETT-PACKARD COMPANY**
3695E Page Mill Road, Palo Alto, California, U.S.A.
Cable "HEWPACK" DAvenport 5-4451
*Field engineers in all principal areas*

**hp complete coverage in quality counters**

## Survey Participants

The following avionics firms participated in the Aviation Week engineering manpower survey: Airborne Instruments Lab, Avien, Bendix Pacific, Bendix Radio, Collins Radio, General Electric (Light Military Electronic Equipment Dept.), Gilfillan, Hoffman Electronics, Hughes Aircraft, Lear, Minneapolis-Honeywell, North American Aviation (Autonetics Division), Sanders Associates, Sperry Gyro, Texas Instruments, and Westinghouse Electric (Air Arm and Electronics Divisions.) Eclipse-Pioneer provided partial data. Companies which declined to participate include: A.C. Spark Plug, GE's Heavy Military Electronic Equipment Dept., W. L. Maxson, Radio Corporation of America, and Wilcox Electric.

show that they underrate the drawing power of higher salary, but there is complete agreement between engineers and companies as to which are the "big three" among motivations: higher salary, greater responsibility, and geographical considerations.

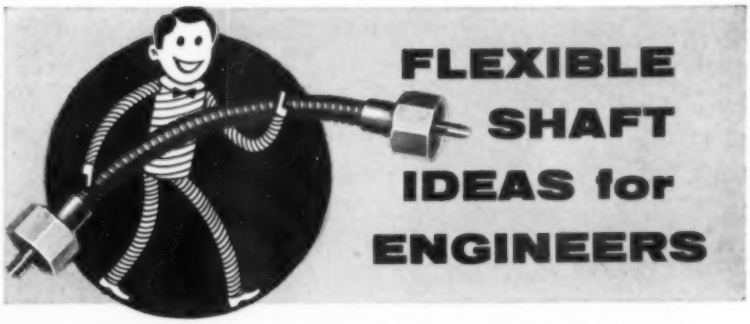
Here are the results of 18 avionics manufacturers evaluation of motivation factors:

- **Greater Responsibility:** 29% of "total vote"
- **Geographical Considerations:** 18%
- **Higher Salary:** 15%
- **Interesting Type Work:** 9%
- **Work for Smaller Company:** 9%
- **Opportunity For Advanced Study:** 8%
- **Company Reputation & Policies:** 6%
- **Work for Larger Company:** 3%
- **Work with "Name Scientists":** 3%

### Experience Vs. Motivation

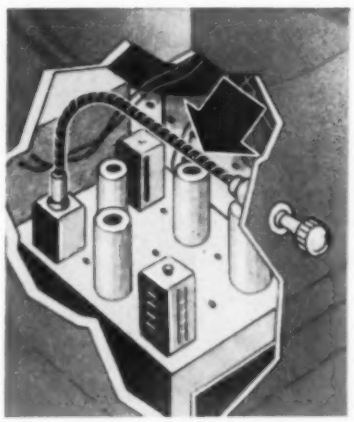
As might be expected, motivation factors change with age and experience. For an example, an analysis of the engineers' returns according to the number of years spent in the profession shows that:

- **Opportunity for advanced study** ranks high with engineers during the first four years in the profession, even outranking higher salary in the 0-2 year bracket. After this period, its popularity falls off sharply.
- **Higher salary remains important** as a motivation regardless of years, but appears to peak in the 2-6 year period, diminishing slightly thereafter.
- **Opportunity for greater responsibility** becomes a very important consideration after an engineer has been in the profession for about six years.
- **Opportunity to work with "name scientists"** apparently does not offer too much incentive to the average engineer at any time in his career; its mo-

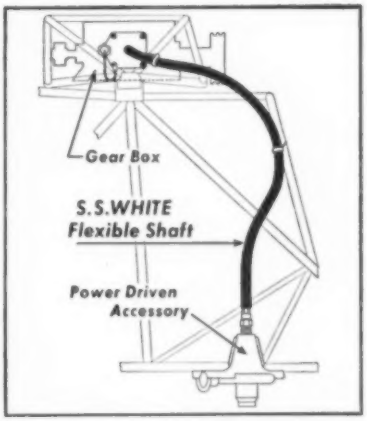




# Flexible Shafts offer big advantages when power or control goes around turns

**Eliminating design and installation problems saves time and costs and improves performance**



Regulating hue contrast on a color TV receiver is simplified by a flexible shaft coupling between control knob and circuit element. Note 90° turn.




A power drive flexible shaft, run around intervening struts and frames, provides a dependable easy-to-install drive for a helicopter pump.

ONE OF THE IMPORTANT ADVANTAGES of a flexible shaft is its ability to operate around turns and under conditions where alignment difficulties make a solid connection either impractical or uneconomical.

*This fact is of prime importance when working out any design where power or control has to be transmitted between two parts. It assures greater design freedom. It simplifies manufacturing and assembly procedures. And it brings about important savings in costs as well as improvements in performance.*

The two illustrations above graphically illustrate how S. S. White flexible shafts provided effective, cost-saving solutions to two power and control problems.

Think of your own equipment. Can you see where you could improve it through the use of flexible shafts? Our engineers will be happy to cooperate with you in making recommendations. There's no obligation, of course.

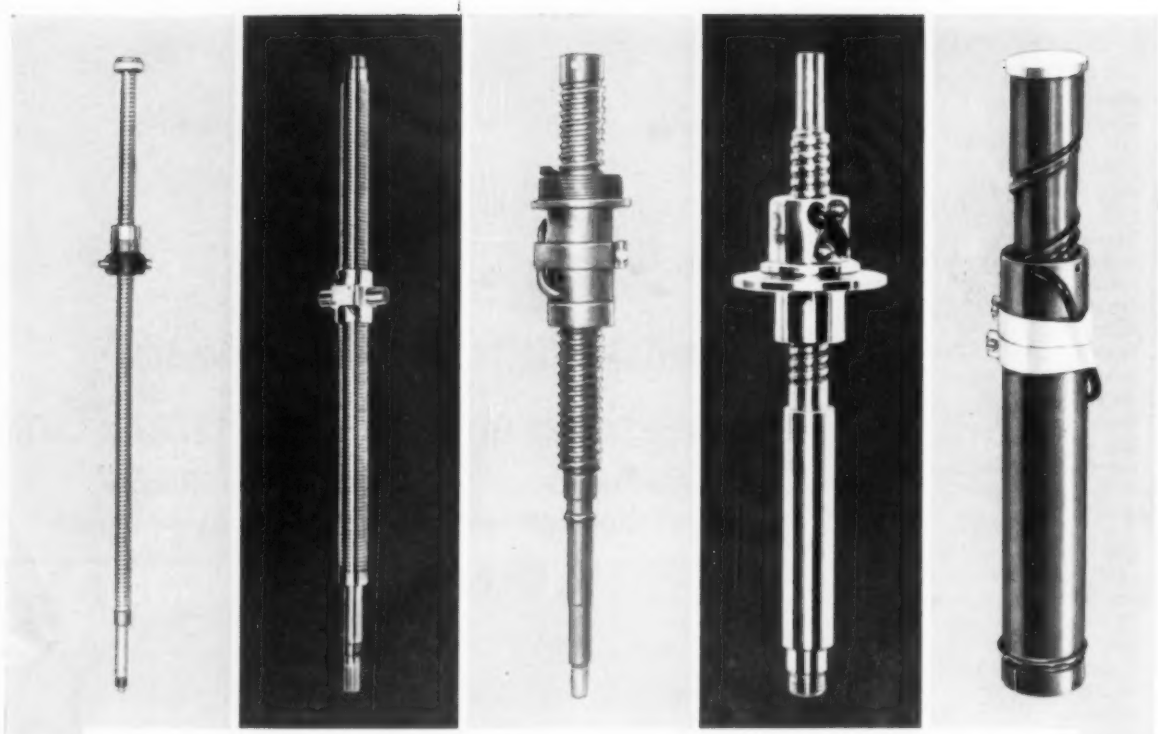
**USEFUL FLEXIBLE SHAFT DATA**

*Bulletin 5601 has concise information on how to select and apply flexible shafts. Send for a copy.*

F6-3

S.S.White FIRST NAME IN FLEXIBLE SHAFTS

S. S. WHITE INDUSTRIAL DIVISION, DEPT. V, 10 EAST 40th ST., NEW YORK 16, N.Y.
Western Office: 1839 West Pico Blvd., Los Angeles 6, Calif.



## WHAT'S YOUR BALL SCREW PROBLEM?

TEMPERATURE? CORROSION? ZERO POSITIONING? LIGHT WEIGHT? LONGER LIFE?

# CPT *Has Solved Hundreds of Them*

We've built CPT Aerol Precision Ball Screws for operation at sub-zero temperatures . . . and at temperatures several hundred degrees above zero. Some CPT Ball Screws are 20 feet long, some as short as an inch or so. Some take loads measured in thousands of pounds, some in ounces.

Every CPT Aerol Precision Ball Screw is engineered for its specific job. Conditions of load, speed, input power, output power, operating temperatures, servicing convenience and weight limitations dictate its design. However, it's possible that an existing CPT Ball Screw design might be adaptable to your particular requirements with resultant savings.

Let us discuss your ball screw needs while projects are still in the early design stages.

*Write for your copy of C-556. You'll see the many problems that have been solved by CPT Aerol Precision Ball Screws.*

**CPT**

**CLEVELAND PNEUMATIC TOOL CO.**

**3781 East 77th Street • Cleveland 5, Ohio**

*Sales-engineering offices in*
*Seattle, Los Angeles, Fort Worth-Dallas and Levittown, L.I.*

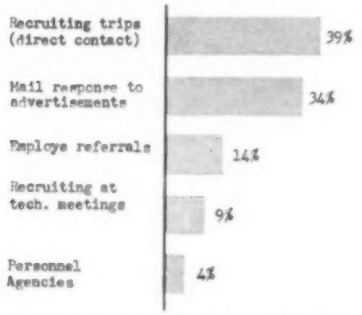
tivation is the most powerful in the first four years, AVIATION WEEK's survey indicates.

For a breakdown of motivation factor rating as a function of an engineer's experience, see chart, p. 65.

### Recruiting Techniques

Despite the hoopla and publicity which has been given to the recruiting of engineers at technical society conventions, AVIATION WEEK's survey indicates that this approach is not too successful in bringing new engineers into the fold.

Avionics manufacturers rated the recruiting techniques that have proven most effective. The results, based on using only first, second and third choices and weighting these three, two and one, respectively, are:




The "employe referrals" and "personnel agencies", shown above both received a significant number of "write-ins."

Compared to a year ago, the supply of engineers appears to be somewhat tighter. In answer to AVIATION WEEK's question, avionics manufacturers replied as follows:

- **Very much tighter:** 47% of replies
- **Tighter:** 16%
- **About the same:** 37%
- **Somewhat easier:** 0
- **Very much easier:** 0

A breakdown of returns according to company location indicates that the manpower situation is tighter on the East and West Coasts than in the Midwest. (See chart, p. 64.)

### Comments on Motivations

In commenting on AVIATION WEEK's survey, a spokesman for GE's Light Military Electronic Equipment Dept. says: "It has been our experience that it is a combination of motivations rather than a single one" which prompts engineers to change jobs.

"In analyzing the reasons why men leave our department we have been unable to say that a particular motivation was greater than another. However, we have found in general that the same things that attract people to us work in reverse in attracting them from us. In other words, opportunity for greater


*Strengthening America's defense of the air...*

RADIO RECEPTOR

*transmitters integrated in the* SAGE *system*

Vital equipment in the SAGE network are Radio Receptor's UHF transmitters and modulator-power supply units. Designed to dovetail into a complex data link chain between ground and air, they transmit tactical data between each crucial stage of this defense program. From the early radar warnings through the final intercept commands, Radio Receptor's transmitters provide the essential communications link for SAGE control.

The UHF transmitter is one of a long series of equipment and systems in the communications, radar and guidance fields developed for the Armed Forces and Industry by Radio Receptor Company. Its critical role in the SAGE program emphasizes our success in meeting rigid design and performance specifications.

*Radio Transmitter T-282B/GR (top right) is a crystal controlled 100 watt, single channel UHF transmitter, designed to cover the 225 MC to 399.9 MC frequency range. The companion Modulator-Power Supply MD-141A/GR provides automatic modulation limiting for high level modulation and AC and DC voltages required for transmitter operation.*

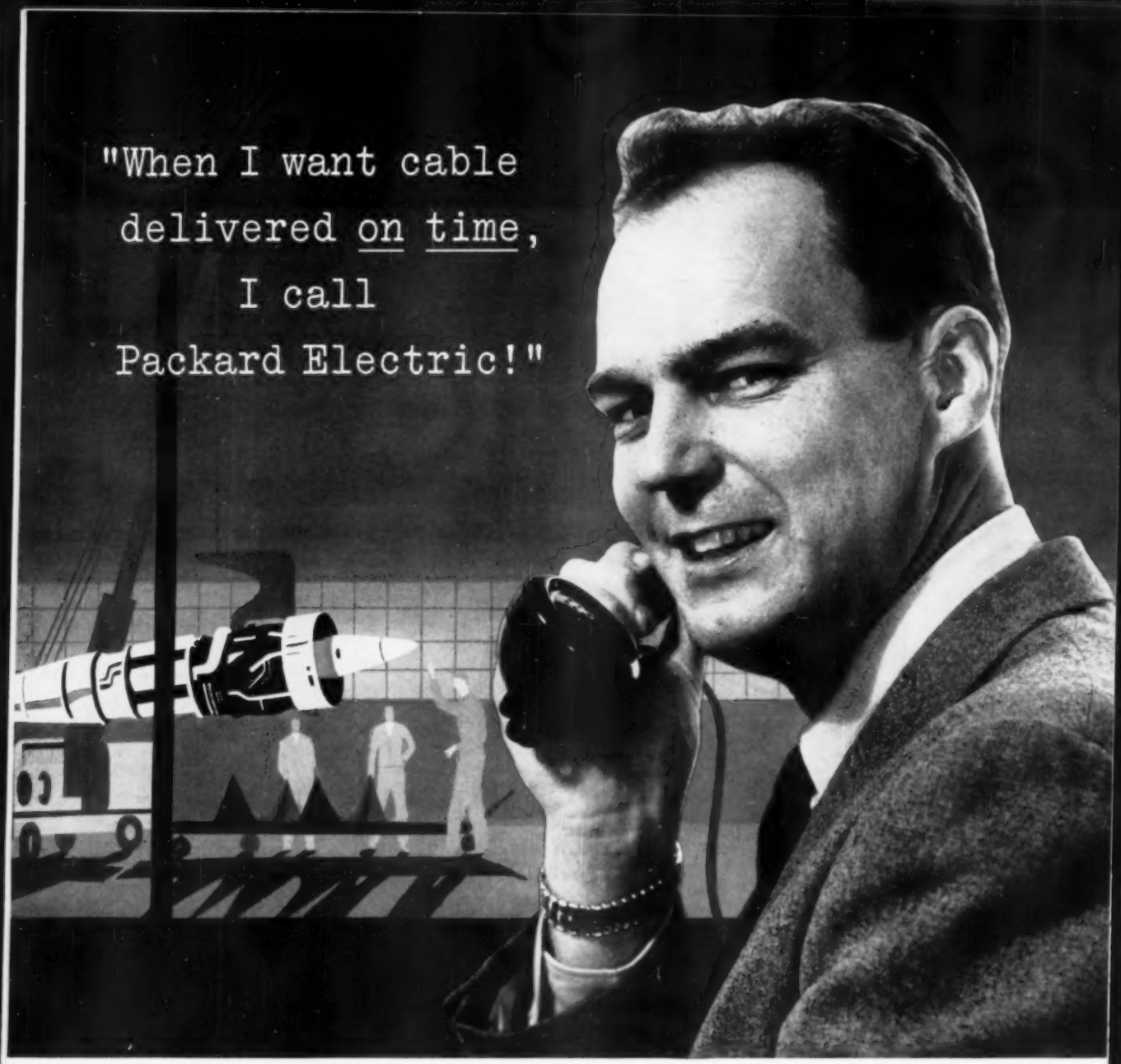
*Engineering Products Division*

**RADIO RECEPTOR COMPANY, INC.**

*In Radio and Electronics Since 1922*

240 Wythe Avenue, Brooklyn 11, N. Y.

RADIO RECEPTOR PRODUCTS FOR GOVERNMENT AND INDUSTRY:
RADAR, NAVIGATION AND COMMUNICATIONS EQUIPMENT, SELENIUM RECTIFIERS, GERMANIUM DIODES, THERMATRON DIELECTRIC HEATING EQUIPMENT.




## *Packard Electric's huge facilities mean prompt delivery of your order — in almost any emergency*

**ANYTIME YOU MUST HAVE ON-TIME DELIVERY** of aircraft cable, *that's* the time to get in touch with Packard Electric at Warren, Ohio. Here at Packard our daily production capacity is over seven million feet of cable—enough to make certain that your order of high or low-tension bulk cable is delivered *at the time you need it.*

**INSULATION THAT IS TOUGH ENOUGH TO RESIST** abrasion, chafing and reduce the likelihood of electrical failure is another reason for making Packard your source for aircraft cable. And should you need cable that resists the effects of spilled fuel, oil or hydraulic fluid . . . or cable that stays flexible under extremes of heat or cold without cracking . . . Packard Electric can supply these, too.

**IN FACT, A COMPLETE LINE** is what makes Packard a *perfect* single source for all types of cable—with important savings to you in accounting and inventory requirements. And the price is right, too, because of savings due to Packard's high volume production. So why not get in touch with us today about *your* cable requirements? We'll be mighty happy to have our engineers discuss your particular cable problem. There's no charge or obligation, of course.

GM GENERAL MOTORS

Packard

REG. U.S. PAT. OFF.

Packard Electric Division
General Motors, Warren, Ohio

*Offices in Detroit, Chicago and Oakland, California • Aviation, Automotive and Appliance Wiring*

## Potpourri

**Interesting and/or unusual reasons listed by engineers for having left their previous employer include the following:**

- **"Previous employer had engineer's union."**
- **"Previous employer had been too small; financial difficulties were source of constant concern. Interested in working for a company that could withstand temporary lulls in contracts."**
- **"Was only offer made on graduation, but was job I wanted."**
- **"Opportunity to get in on ground floor of a potentially large company."**
- **"Company attitude toward professional people."**
- **"Fired from previous job."**
- **"Ownership participation with new employer."**
- **"Intolerable conditions under previous employer."**

responsibility, increased pay, and geographical considerations seem to run through all motivations."

Sperry Gyroscope says: "During 1955 we found that the main reasons for engineers terminating voluntarily were: (a) opportunity for advancement, (b) salaries, (c) location. During 1955 we increased the salary of engineers, provided additional educational benefits, and spent a great deal of effort in the utilization of and communication with our engineers. These four steps have eased the serious problems between 1950-54 in hiring and retaining the desired work force.

"The drafting of engineers accounted for one half of our terminations during 1954. The current trend of granting engineers deferments has been of great help in maintaining our engineering force.

"We have found that our terminations occur in the 2-3 years experience level of engineers. This group can almost invariably obtain a salary increase by moving to another company. Currently we are examining our benefits and incentives to try to overcome the tendency of this group to job hop," Sperry says.

"We anticipate the need for very careful management attention to the engineers' needs in the future (educational, monetary, etc.) for us to obtain our share of the dwindling supply of engineers," Sperry concludes.

### A Moral

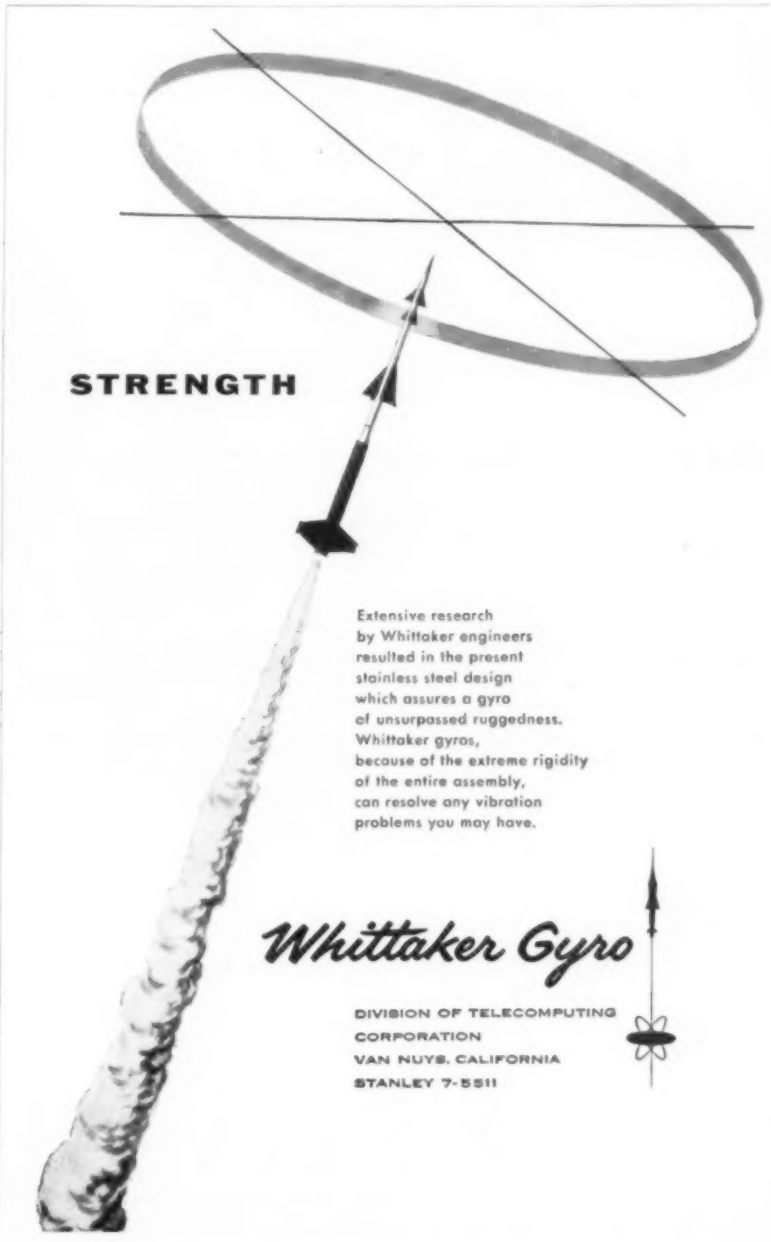
Of the three major motivations which prompt an engineer to change jobs, at least two are within the control of his employer: salary and opportunity for greater responsibility.

The high rate of turnover revealed by AVIATION WEEK's survey suggests that companies may find it profitable to divert more attention from the recruiting of new engineers to the problem of keeping the ones they have reasonably contented. The economic loss to a company who loses a good engineer, taking valuable company know-how to a competitor, coupled with the cost of recruiting a replacement and training him, may be far more than the cost of correcting the conditions which prompt a high engineering turnover.

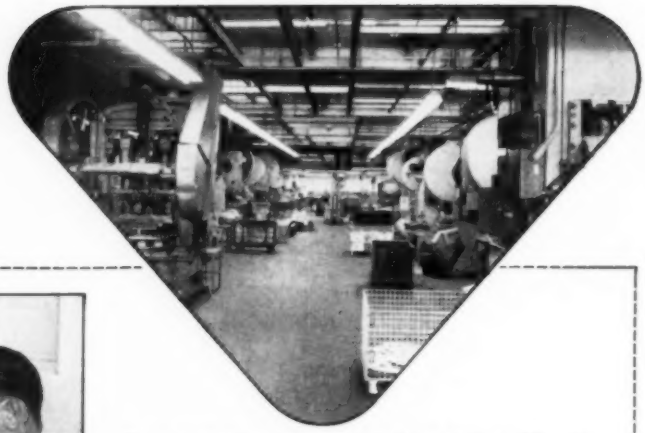
On the other hand, so long as the demand for avionics engineers remains far out of balance with the supply, industry may have to learn to live with a high engineering turnover.

## New Avionic Bulletins

- **Ceramic capacitors,** four types. Data Sheets TC-1A, HC-1A, MP-1A, and MIN-1A. Glenco Corp., Metuchen, N. J.
- **Tandem transistors,** two element semiconductor in a single case. Four-page bulletin gives application data. Marvelco Electronics Div., National Aircraft Corp., 3411 Tulare Ave., Burbank, Calif.
- **400-cycle frequency meters,** expanded scale type for panel mounting. (2 pp.) Arga Division, Beckman Instruments, Inc., 220 Pasadena Ave., So. Pasadena, Calif.
- **Power supplies,** ranging from 6 to 115 v.d.c. as well as airborne types. Six-page bulletin, No. S-56, gives characteristics. Perkin Engineering Corp., 345 Kansas St., El Segundo, Calif.
- **Computing and simulation services** available to industry, seven-page bulletin. J. B. Rea Co., Inc., 1723 Cloverfield Blvd., Santa Monica, Calif.

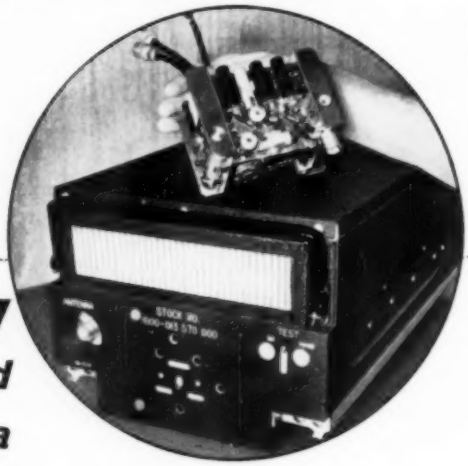
## *The right people with the right facilities produce the right solutions*



Sheet stock press room and machine shop in Sylvania Buffalo manufacturing plant.

*G. L. Downs*, Plant Manager, *S. Ferrantini*, Senior Industrial Engineer, and *B. J. Pratt*, Supervisor of Industrial Engineering, discussing typical manufacturing techniques involving etched wiring assemblies.

Seven-tube, fixed-frequency "Guard Receiver" (top)—a Sylvania-produced sub-assembly of the AN/ARC-34 UHF Aircraft Transmitter-Receiver (bottom).



# Air-Com reliability

## ...mass-produced by Sylvania

THE HIGH RELIABILITY essential to multi-channel voice communication for military aircraft is achieved by the AN/ARC-34 UHF Transmitter-Receiver illustrated. Used as a tactical Command Set, the ARC-34 provides dependable communications under all flight conditions.

Major sub-assemblies of this unit are produced by Sylvania in the Electronic Systems Division plant in Buffalo, New York. Because product engineering, manufacturing operations and quality control are thoroughly integrated within the Division, reliability of the end equipment is achieved on a mass-production basis.

In all of Sylvania's Electronic Systems Division installations, the *right* people work with the *right* facilities, within a sound managerial environment. That is why they have produced the *right* solutions to a variety of problems, and have made many important contributions in the fields of aviation electronics, guided missiles, countermeasures, communications, radar, computers and control systems. Whether the problem is military or industrial, Sylvania's business is to come up with electronic solutions that are *producible*.

In addition to its Buffalo manufacturing plant and laboratory facilities, the Electronic Systems Division has installations at Waltham, Mass., and Mountain View, Calif., staffed with top-ranking scientists and engineers, and backed by Sylvania's extensive resources in the electronics field.

**SYLVANIA IS LOOKING FOR ENTERPRISING ENGINEERS**

*Sylvania has many opportunities in a wide range of defense projects. If you are not now engaged in defense work, you are invited to contact Edward W. Doty, Manager of Personnel, Electronic Systems Division, Sylvania Electric Products Inc., 100 First Avenue, Waltham 54, Mass.*

# SYLVANIA

SYLVANIA ELECTRIC PRODUCTS INC.

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## Expansions, Changes In Avionics Industry

Hughes Aircraft Co. will increase its Tucson, Ariz. Falcon (air-to-air) missile manufacturing facility with a new 500,000 sq. ft. expansion, to be completed early in 1958. The company also is negotiating for an additional 100,000 sq. ft. of space from the Tucson Airport Authority. Number of Tucson employes is expected to increase from 5,000 to 8,000 by 1958, according to L. A. Hyland, vice president and general manager.

Other expansions include:

• **Battelle Memorial Institute,** Columbus, Ohio, formed two new operating groups: Systems Engineering Division and the Electronic Reliability Division. The former will work in the field of datamation, information theory, human engineering and systems simulation. Joseph J. Stone heads the Systems Engineering Division. The Electronic Reliability Division is headed by K. E. Cochran.

• **General Precision Laboratory,** Pleasantville, N. Y., broke ground for a 23,000 sq. ft. environmental test facility, slated for completion late this year. The new facility will permit tests at simulated altitudes up to 100,000 ft., provide temperature extremes of —80C to 300C, and acceleration forces up to 50G's. Sand and dust storms with air velocities up to 250 ft./min. can also be simulated.

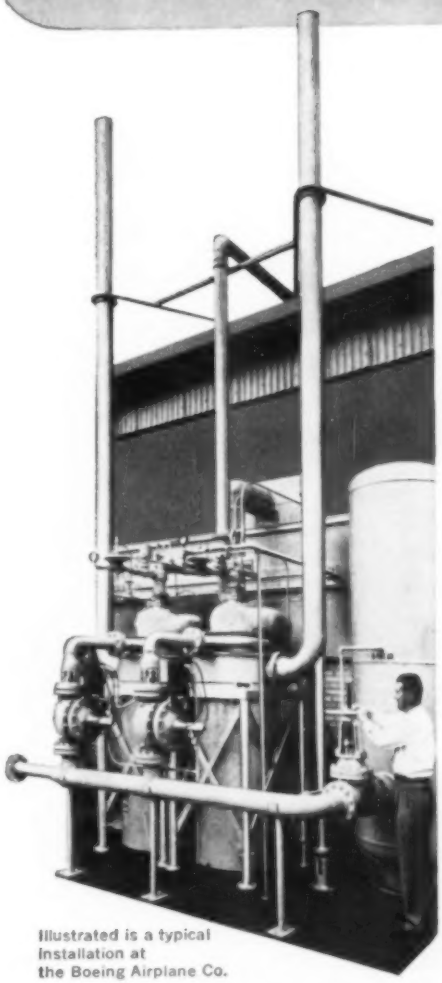
• **Barry Controls, Inc.,** Watertown, Mass., purchased the physical assets of the U.S. Sheet Metal Products Co., Burbank, Calif., to establish a West Coast facility for the design and production of isolation mounts for aircraft and missiles.

## FILTER CENTER

▶ **ACAS Goes To Work**—General Electric will put the GE-developed Automatic Component Assembly System into pilot production at its Light Military Electronic Equipment Dept., Utica, N. Y., for evaluation under a million dollar Signal Corps contract. ACAS, designed for the flexibility needed for short production runs, was developed under Signal Corps sponsorship (AW May 2, 1955, p. 42). The system automatically places up to 1,600 components per hour in printed-wire boards, dip-solders up to 120 boards per hour and makes five electrical tests per second.

▶ **Automation Defined**—The Radio-Electronics-Television Manufacturers Association defines the much-used term


FOR FLEXIBILITY
IN TEST FACILITY
AIR HEATING...USE
THERMAL
TYPE D F HEAT EXCHANGERS



Illustrated is a typical installation at the Boeing Airplane Co.

The extreme load change rates required to test air driven accessories and components for jet powered aircraft are easily and **quickly** obtained when your test facility uses THERMAL Type DF heat exchangers. Standard sizes are available from 750,000 to 8,000,000 Btu/hr duty — all rated at 300 psig and 1200 F. All may be gas, oil or combination fired and are complete factory built "package" units.

***stress free design...***

Years of trouble free service are assured by this simple yet remarkably compact design. The heater is two pass — counterflow. One pass is coiled to eliminate the need for expansion joints. Construction is all welded and all stainless steel — and guaranteed.

For complete information, write for THERMAL Bulletin No. 105.

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Gas, Oil & Combination Burners • Air Heaters • Submerged Combustion • Combustion & Heat Transfer Equipment

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"automation:" "Automation is the technique of improving human productivity in the processing of materials, energy, and information by utilizing, in various degrees, elements of self-control and of automatically executed producted programming."

► **CPA Buys British Flight Control**—Canadian Pacific Airlines specified the Smiths Flight System for its four Britannia 310 aircraft for 1957 delivery. CPA is the first North American operator to select this new integrated flight control (autopilot) and instrument system.

► **Datamation Made Easy**—The J. B. Rea Co., Inc., 1723 Cloverfield Boulevard, Santa Monica, has prepared a series of recorded lectures and slide films to explain the basic principles of computer operation to non-technical people. Available free-of-charge to colleges, it may be rented by other groups.

► **NWA Buys More Radar**—Northwest Airlines has ordered 19 more Bendix RDR-1 X-band radars, bringing its total on order to 33 systems. Airline also ordered 28 Bendix VHF 360-channel receivers with 50 kc. channel spacing, in addition to 55 sets purchased earlier.

► **Convair, NAA Increase Brainpower**—Convair and North American Aviation are rapidly increasing their already sizable datamation facilities:

• **Convair** ordered 14 special purpose digital computers, at a cost of $700,000, from Berkeley division of Beckman Instruments, for processing inflight data at Convair installations at Edwards AFB, Calif., Patrick AFB, Fla., and San Diego.

• **North American** has taken delivery of an ALWAC digital computer, made by Logistics Research Inc., for use by its flight test instrumentation group to reduce flight test data.

► **New Publications**—Four recent reports of interest to avionics engineers, are available from the Office of Technical Services, Dept. of Commerce, Washington, D. C.

• **"Techniques for Application of Electron Tubes in Military Equipment,"** prepared by Wright Air Development Center, supersedes WADC Technical Report 55-1, dated Jan. 1955. The report, identified PB 111644R, lists application data on 26 tube types for equipment designers. Price is $5.00.

• **"Increasing the Reliability of Electronic Equipment by the Use of Redundant Circuits,"** PB 111740, by C. J. Creveling, Naval Research Lab. Price 50 cents.

• **"Circuit Equations for Rectifier and Magnetic Amplifier Circuits,"** PB 111770, by D. N. Schaefer, Naval Research Lab. Price: $1.00.

• **"Fast Carry Logic for Digital Computers,"** PB 111751, by Bruce Gilchrist, J. H. Pomerene and S. Y. Wong, Institute for Advanced Study. Price: 50 cents.


# REVISED CATALOGUE of METAL HYDRAULIC CLOSURES for AIRCRAFT

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## Transistor Fuel Gage

**High temperature transistorized fuel gage, capable of operation at 100C, uses silicon transistors and reportedly meets MIL-G-7817, 7818. System consists of power unit (l.) and indicator, available either in 1½ in. diameter model shown or larger 3½ in. unit, plus conventional capacitance tank probe. New system can be used also for gaging fuel in auxiliary wing-tip tanks. The Liquidometer Corp., 36th St. & Skillman Ave., Long Island City, N. Y.**

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The Lear Omnimeter is a 3-in-1 instrument for the presentation of VOR bearings.

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Simpson's advanced Core Magnet Meter Movement is the answer to many aircraft instrument problems. Among its important features is complete *self shielding*. There are no stray magnetic fields to cause compass deviation, loss of magnetic efficiency, or the necessity for bulky compensation. Another important quality is its extraordinary resistance to shock—many times that of conventional D'Arsonval meter movements, as shown by tests.

The Simpson Core Magnet Meter Movement also offers light weight and extra compactness. Check your requirements against this Simpson movement today. Write or phone for complete information.

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Today's jet pilot probes the upper reaches of earth's atmosphere. He travels higher, faster, farther than any man before him. In the not-too-distant future, manning new types of aircraft, he will conquer the final frontier—deep space. As the demands of ship and mission go beyond human reaction, he increasingly depends on electronic systems to guide him, scan his surroundings, aim and fire his missiles, maintain his communication.

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**CAMDEN, N. J.**

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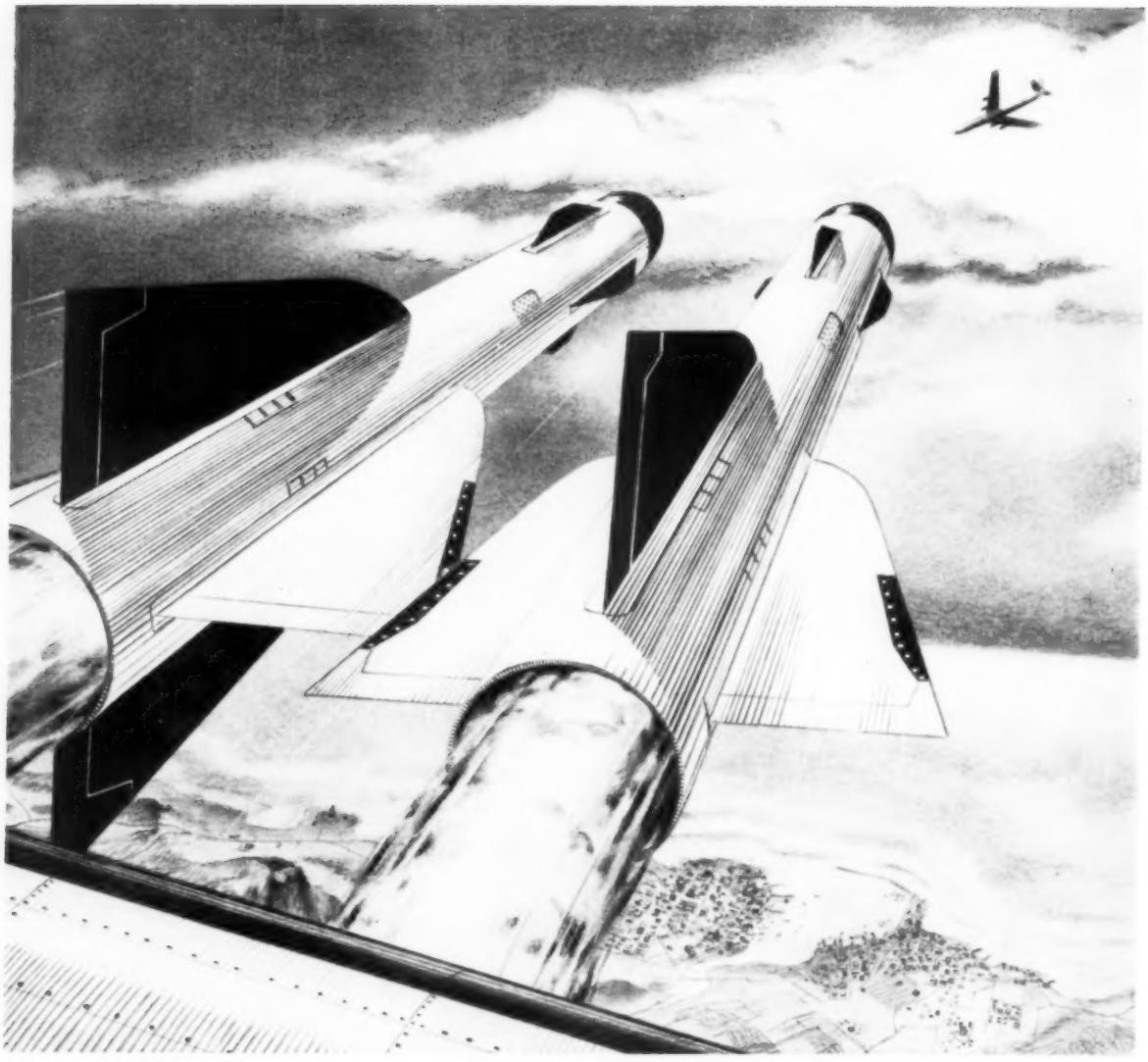

# Solar skills help produce guided missiles in quantity

**INFORMATION BOOKLET**

New brochure on Solar missile production capabilities—write for a copy today.

**GUIDED MISSILES REQUIRE** imaginative engineering and precision fabrication with unending emphasis on quality. Solar has stressed these attributes for decades in designing and building aircraft components of tough alloys for use under stringent service conditions. In addition, Solar's direct activity in missile programs extends from research and development work through to volume manufacture of components—such as current fabrication of fuselages for the air-to-air Hughes Falcon. For more information on Solar's missile production capabilities, write Dept. C-19, Solar Aircraft Company, San Diego 12, Calif.

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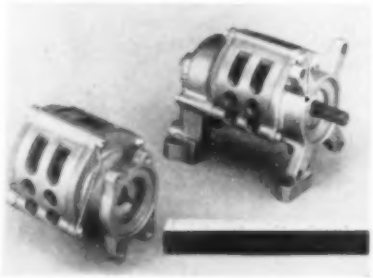
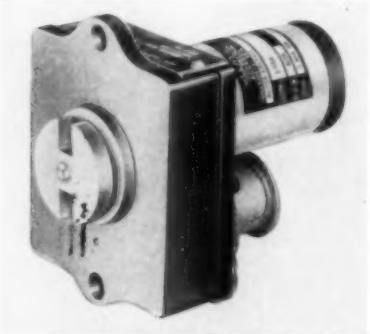


### Air Motor for Missiles

Constant-displacement rotary vane air motor operates an alternator and hydraulic pump for an electro-hydraulic supply to power a missile control system. Basic motor weighs 1.5 lb. and develops 2.75 hp./100 psi. inlet pressure. It will perform satisfactorily with 300 psi. at inlet.

Unit is claimed to be qualified for missile applications over an ambient range of −20F to 160F and accelerations of 60G.

**Pacific Division, Bendix Aviation Corp., 11600 Sherman Way, N. Hollywood, Calif.**



### Aircraft Rotary Actuator

Series R-4100 rotary actuator for aircraft applications is rated at 36 lb. in. maximum and 3 rpm. with magnetic brake and adjustable limit switches up to 120-deg. rotation. Weight is 10 oz. and the dimensions are 2 in. x $2\frac{5}{8}$ in. x 3 in.

Thermal protection is optional. The actuators meet specification MIL-A-8064.

**Airborne Accessories Corp., 1414 Chestnut Ave., Hillside 5, N. J.**

### AN Contact

"Super-16" AN contact design, using No. 16 female contacts, has hooded front for oversize test probes. Unit is said to save about five pounds per average fighter plane. The unit is also designed to provide engagement with a mating pin at a point further forward than other contacts used in AN connectors, giving a longer wiping action on mating contacts.

Product meets specifications of pending MIL-C-5015C.

**American Phenolic Corp., Chicago 50, Ill.**

### Transistorized Fuel Gage

Silicon transistorized aircraft fuel gage operates at 100C and is designed to operate as an integral part of a capacitor-type measuring system. Gage can be used with auxiliary fuel tanks.

The gage meets or surpasses applicable sections of specification MIL-G-7817 and 7818. Power is 115-v., 400-cycles.

**Liquidometer Corp., 36th St. & Skillman Ave., Long Island City, N. Y.**

### Emergency Runway Light

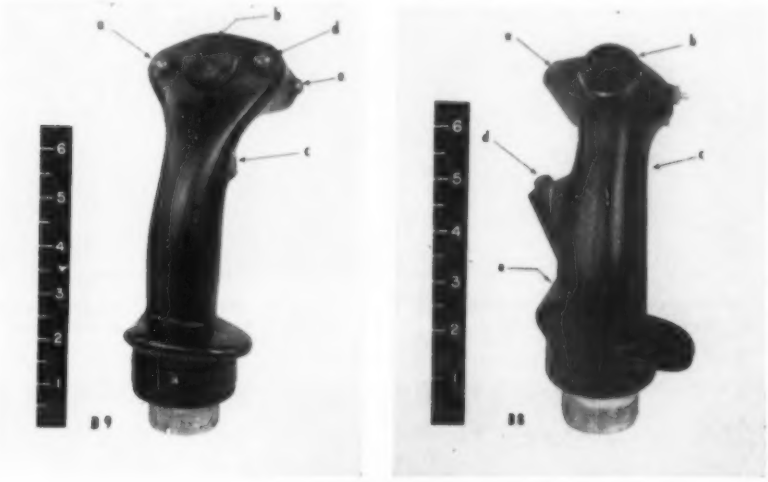
Bekon emergency runway lights operate up to 72 hours without a battery change, come with different color filters for various applications: runways, taxiways, boundaries, thresholds and last 1,000 ft. of runway.

They can be connected to 110-v. current. With ballast, the weight is about 20 lb. The base is duck, domes are plastic. Military users include Strategic Air Command and Military Air Transport Service.

**Standard Parts & Equipment Corp., P.O. Box 4506, 904 Main, Ft. Worth, Tex.**

### Valve for Wind Tunnels

'Scanivalve' motor-driven sampling valve, for transonic wind tunnels, connects an integral pressure transducer sequentially to 48 pressures. Unit meas-




## New Stick Grip

**New B-9 aircraft control stick grip (left) has been developed by the Aero Medical Laboratory, Wright Air Development Center. The old B-8 grip is at the right. The new arrangement makes it easier for pilots to reach control buttons quickly, especially when being subjected to high G loads, according to Wright Field officials. The B-9 grip is currently undergoing flight tests. Controls are: (a) rocket release; (b) four-way trim switch; (c) gun trigger; (d) bomb release; (e) autopilot disconnect or nose wheel steering.**

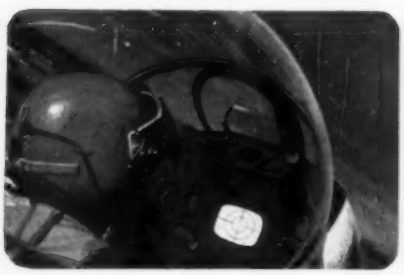
Capable of carrying atomic weapons, the F-101A is scheduled for assignment to the Strategic Air Command. G-E automatic electric system and computing sight help make it one of the most advanced fighters in the air today.

GENERAL ELECTRIC

# How G-E Electric System and Gunsight Help

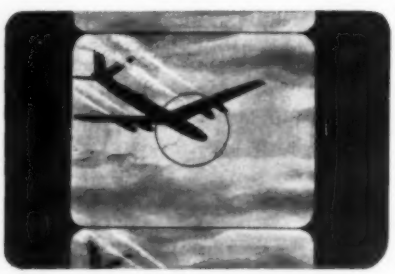
Main components of system include static voltage regulator and control panel.

Alternator receives test. General Electric tested the complete F-101A electric system prior to first airplane installation.



Typical computing sight operation: pilot makes contact and aligns target in sight.

Pilot keeps enemy aircraft aligned in sight and fires when target is within range.



Hit! Camera guns show that enemy would have been destroyed.

# Make F-101A a Potent SAC Fighter-bomber

- **G-E power generating system eliminates 10 pilot functions in start-up**
- **G-E computing sight permits more accurate weapons firing**

The Air Force's new supersonic jet fighter, the McDonnell F-101A Voodoo, is being equipped with a G-E computing sight and an automatic electric system which requires no pilot attention.

Designed with emphasis on simplifying the job of the pilot through use of automatic equipment, which includes a paralleling control furnished by another manufacturer, the G-E electric system begins operating as soon as the pilot starts the engine.

**SPEEDS TAKE-OFF** The control has only two toggle switches, which may remain "on" at all times, even when a fault develops. This eliminates a series of 10 pilot functions, and sharply reduces the time to become airborne.

With a generator that can operate at the high ram-air temperatures of supersonic flight, and a static voltage regulator that has no moving parts except the relays, the G-E system is designed for long life and reduced maintenance time. The control panel supplies the automatic control of start-up, shutdown, and maximum selective protection against ground fault, over- and under-excitation, and over- and under-voltage.

**LIGHTWEIGHT GUNSIGHT HAS HIGH ACCURACY** Giving the F-101A high fire-control accuracy for air-to-air gunnery is the G-E designed computing sight. It features lightweight and low maintenance due to its simple design. Automatic inputs assure the sight's accuracy for all modes of operation.

For more information on the General Electric power generating system, write Section 210-97, General Electric Co., Schenectady 5, N. Y. If you are cleared to receive classified material, see your nearest G-E Apparatus Sales representative for advantages of the computing gunsight. General Electric Company, Schenectady 5, N. Y.

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**ALL SANBORN 150 SERIES OSCILLOGRAPHIC RECORDERS PROVIDE THESE**

**SPECIFIC ADVANTAGES**

The three foremost operating advantages of a Sanborn "150" are evident in the record, and are given at the right. Equally popular with industrial users is the *wide versatility* of these systems. Each one comprises a basic assembly to which the user adds his choice of an interchangeable, plug-in type preamplifier for each channel. Presently available different preamplifiers now number *eleven*.

**Rectangular Coordinate Recording**

is a Sanborn feature that is especially valuable in multi-channel recording. The user of a 2-, 4-, 6- or 8-channel "150" system can record interrelated events simultaneously on one strip of record paper, and then correlate them against time quickly and accurately, even during the recording.

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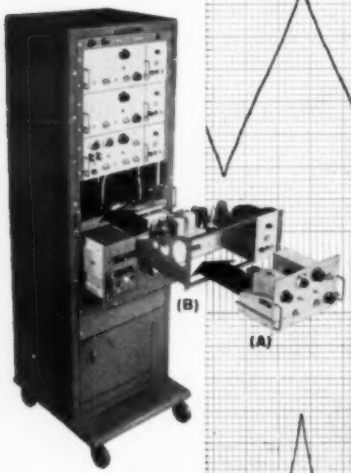
The nichrome ribbon tip "150" heated stylus removes the white opaque surface of Sanborn recording paper (Permapaper) permitting the black undercoating to show. Tracings are permanent, will not fade or smudge.

**Improved Over-all Linearity**

resulting from current feedback design of Driver Amplifiers and new shorted coil frame, high torque (200,000 dyne cm.) galvanometers. Maximum error over middle 4 cm. of chart: 0.25 mm . . . over entire 5 cm. chart width: 0.5 mm.




Preamplifier (A) shown in position to plug into a Driver Amplifier with Power Supply (B) which are normally already in place in the Basic Cabinet Assembly

A new "150" Catalog provides complete descriptive data, specifications and prices on all 150 Systems, Accessories and Cabinets. A copy will be sent on request.

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ures 1¼-in. diameter x 5¼-in. long. The transducer cavity fits several different one-half inch diameter commercial transducers.

Speeds are available from one scan per second to one per minute. An electrical valve position indicator is available for analog or digital read-out systems.

**General Design, 631 30th St., San Diego 2, Calif.**

## Rocket Conditioner

Conditioning box for developing a temperature range from 170F to −100F is used for soaking solid-propellant missile booster or Rato rockets prior to subjecting them to functional tests.

Cooling is produced by cascade-type

mechanical refrigeration system using Freon refrigerants and two compressors. Supplementary cooling is provided by a $CO_2$ injection system.

**Moore & Hanks, El Monte, Calif.**

## Altitude Simulator

Equivalent flight performance at altitude variations of −1,000 ft. to +80,000 ft. are reproduced continuously by dynamic simulator that incorporates control arrangements permitting it to be commanded directly from an analog computer.

A 9-in. diameter by 24-in. long cylindrical housing can be subjected instantaneously to pressure variation

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- that has a frequency range of 50-200 *mc*
- that is continuously tunable over the entire frequency range without switching
- that has AM-FM-c.w. selection
- that has variable bandwidth

This VHF Communications Receiver was developed at Servo Corp. to fill the need for a high quality, general purpose unit that could be used *both* in laboratory work and in the communication field. Built to the most exacting standards, this receiver also provides:

- automatic noise limiter
- exclusive squelch circuit
- patented 72" bandspread dial with a resolution of 0.1%
- maximum sensitivity: 1 micro-volt input or less will produce a 10-db signal plus noise-to-noise ratio over entire frequency range
- high frequency stability: less than 0.08% drift over line voltage range of 105-125 volts . . . over ambient of—10°C to +60°C temperature and 0 to 95% humidity
- less than 50 micro-micro watts radiated local oscillator power

Our VHF Communications Receiver is being used in general communications work; in the laboratory to calibrate other receivers; flight-testing; control tower; telemetering; propagation studies; evaluating transmitters; and meteor research.

For the full story on our VHF Communications Receiver, please fill in your name and title in the coupon below. Attach it to your letterhead and mail to me.

Jules Cardon
Staff Engineer
Radio Engineering Dept.

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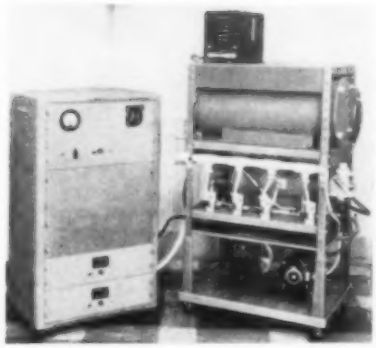
SERVO CORPORATION OF AMERICA

Jules Cardon, Dept. C-4
Servo Corporation of America
20-20 Jericho Tpke., New Hyde Park, L.I., N.Y.

Please send me more information on V.H.F. Communications Receiver.

Name.....

Title.....

corresponding to 50,000 fpm. altitude variations.

Instrument operates from 750 watts of 60 cycle, 115-v. power.

**Color Television, Inc., 913 E. San Carlos Ave., San Carlos, Calif.**

### Lightweight Power Generator

Model 5903 series gasoline engine-driven generators weigh less than 35 lb. and are contained in a 1.5-cu.-ft. package. Unit supplies either 1,350 watts d.c. or 1,500 watts 400-cycle a.c. for aircraft electrical systems and to operate communication equipment on the ground. It also can power electric tools.

Fuel consumption is about one gallon/hour. Engine has an automatic rewind starter and muffler.

**LearCal Division, Lear, Inc., 3171 S. Bundy Drive, Santa Monica, Calif.**

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**Short Tap-Lok inserts** for applications where thickness of material prevents the use of regular length Tap-Lok insert. —Groove-Pin Corp., 1125 Hendricks Causeway, Ridgefield, N. J.

**Sprayable paint booth coating** will strip off quickly in large pieces—Oaklite Products, Inc., 157 Rector St., New York 6, N. Y.

**Traf-O-Lite,** a signaling flashlight, is designed for control and traffic direction in military and civilian airport installa-


An Engineer Speaks Out...

## ...about Design Testing of Complete Systems

The Servomation® Building Blocks, as a design and test lab, have wide application in the development and synthesis of control systems of drone aircraft; control and guidance systems of guided missiles; and automatic airspeed and altitude controls. The Building Block computer components are available as 60 or 400 cycle units, and specifically packaged so that individual units can be installed as part of an airborne control system for preliminary flight tests before the final design is frozen.

As a design, analysis, and test center, the Servomation® Building Blocks offer the design engineer equipment that features exceptional flexibility and ease of operation. Servo control systems can be quickly mocked-up and tested, with the wide variety of standard servo components, external patch cord and jackboard connections, and the versatile Servoboard® and Servoscope® components of the Building Blocks. Closed loop characteristics can be predicted and pre-production "bugs" eliminated. The Building Blocks also allow you to change design parameters in the mechanical part of the system simply by rearranging or substituting components.

In addition to its function as a design and test lab, the Servomation® Building Blocks can also perform as an automatic production control system, data processing center, and electro-mechanical computer.

For the full story on the Servomation® Building Blocks, please fill in your name and title in the section below. Attach it to your company letterhead and mail it to me.

Thos. Westover
Chief Control Systems Engineer

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Please write giving complete details and we will answer immediately.

**J. L. Hobel,** *Industrial Relations Manager*
**Rohr Aircraft Corporation**
Chula Vista, California, *DEPT. 27*

9 miles south of San Diego on sunny San Diego Bay.

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FOR MEASURING TEMPERATURES IN AIRCRAFT

AN5540-2 AN5541-1 AN5545-1

**AN5540-1** 18 MM. iron-constantan Sparkplug-gasket type thermocouple for measuring cylinder-head temperatures. Also available in copper-constantan and in 14 MM size for either material.

**AN5540-2** Iron Constantan Sparkplug-gasket type with copper ring for 18 MM plugs. Wire guard and supporting bracket are stainless steel and conductors are protected with flexible heat-resistant sleeving. AN5539 terminals are silver-soldered to leads.

**AN5541-1** Iron Constantan Bayonet Type thermocouple with junction located in silver tip. Spring used with this thermocouple will retain its strength despite high temperatures.

**AN5545-1** Chromel-Alumel Tailpipe Thermocouple. Insulated with a temperature-resistant ceramic and overbraided with stainless steel wire, this thermocouple is built to withstand severe jet engine service.

***We invite inquiries on your temperature measuring problems.***

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*Manufacturers of Complete Temperature Measuring Systems for Aircraft*
**NAUGATUCK, CONNECTICUT**

tions. A 4½-in. length of solid, cast acrylic rod (1¼ in. in diameter) is mounted in the lens ring. Sides of the rod glow and a piercing beam of white light is thrown from the end.—Ray-O-Vac Co., 212 East Washington Ave., Madison 10, Wis.

**Type 24-210,** portable leak detector, can be used to show the existence or absence of extremely minute leaks, to determine the rate and location of leakage Instrument is a simplified mass spectrometer which responds only to the presence of helium as a tracer gas.—Consolidated Electrodynamics Corp., 300 North Sierra Madre Villa, Pasadena, Calif.

**Cush-n-Foam,** for cushioning and sound-absorptive applications, is flame-retardent and unaffected by temperature, climate and most dry-cleaning chemicals.—Hudson Foam Plastics Corp., Yonkers, N. Y.

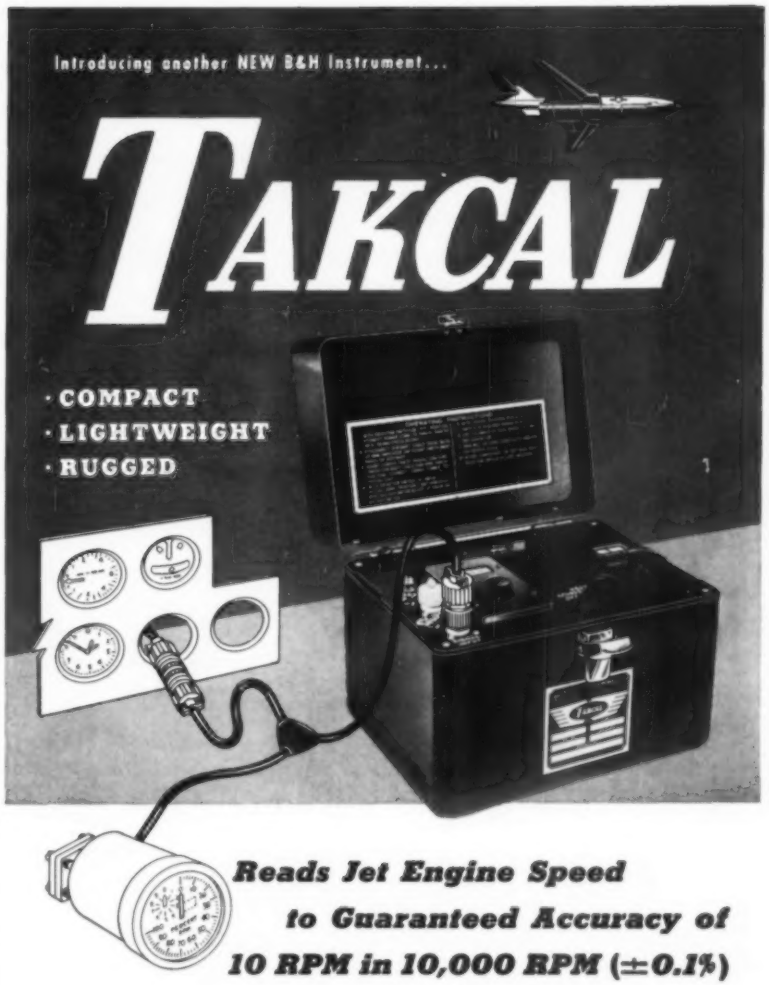
# WHAT'S NEW

## Telling the Market

**How to Ship by Air in Corrugated Boxes,** booklet, revised edition, Hinde & Dauch, Sandusky, Ohio . . . **Electromechanical assembly components** for "breadboards", available individually or as kits, brochure TDS 1110, Servo Corporation of America, 20-20 Jericho Turnpike, New Hyde Park, L. I., N. Y. . . . **List of 500 Navy prime contractors** in 41 states who sub-contract work to small businessmen and directory of Industry Cooperation Representatives located at Navy general inspection offices, booklet, Small Business Branch, Office of Naval Material, Navy Dept., Washington 25, D. C.

Presentation of probable requirements for **aids to navigation of helicopters operating in 1958-1965,** Helicopter Navigation Requirements, report, Bendix Pacific Division, Bendix Aviation Corp., 11600 Sherman Way, North Hollywood, Calif. . . . Technical data **on Series 1400 continental connector** with hermetic seal, bulletin 48E, Electronic Sales Division, DeJur-Amsco Corp., 45-10 Northern Blvd., Lang Island City 1, N. Y. . . . Information on **low-heat input metal-joining processes** for production and maintenance welding, booklet TIS 2367, Technical Information Service, Eutectic Welding Alloys Corp., 40-40 172nd St., Flushing 58, N. Y.

Performance and operating date of **environmental test equipment,** booklet, Murphy & Miller, Inc., 1326 South Michigan Ave., Chicago, Ill. . . . Specifications, flow rates and engineer-

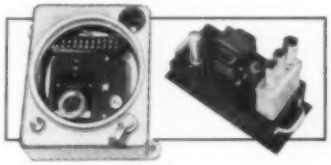




**Reads Jet Engine Speed to Guaranteed Accuracy of 10 RPM in 10,000 RPM (±0.1%)**

The new B&H TACKAL incorporates a refinement of the frequency meter principle. It operates in the low (0 to 1000 cps) range, reading the frequency of the tachometer generator on a scale calibrated in percent RPM corresponding to the engine's RPM. In addition the TAKCAL checks the tach system. The TAKCAL circuit and tachometer are parallel so that readings can be made simultaneously to determine the accuracy (or inaccuracy) of the aircraft's tach system. The TAKCAL operates during the engine run to properly set up engine controls for maximum economy and safety.

Originally developed as a component part of the J-Model JETCAL ANALYZER, the TAKCAL is now available as a separate unit for use with all earlier models of the JETCAL TESTER.

The TAKCAL operates accurately in all ambient temperatures from −40°F. to 140°F. Low in cost for an instrument of such extreme accuracy, it is adaptable to application in many other fields.



Explosion-proof TAKCAL for special applications. Measures 200 to 7500 RPM, direct reading, with ±0.1% accuracy.

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# "Mr. Helicopter"

When Capt. William E. Brake evacuated *900 wounded men* in Korea, grateful soldiers inspired a very appropriate nickname for this U. S. Army pilot—"Mr. Helicopter."

Capt. Brake flew 587 missions in his Bell H-13 helicopter, often under direct fire from the enemy front lines, to bring his injured charges safely and quickly back to Mobile Army Surgical Hospitals. Some were so seriously hurt that evacuation by any other means of transportation would have been fatal.

A native of Lansing, Mich., Capt. Brake's present assignment is as a helicopter instructor at the Army Aviation Center, Fort Rucker, Ala., where he shares his vast combat and rotary wing experience with the Army's newest flying recruits.

**Capt. William E. Brake**
*...Shares his experience*

The U. S. Army has to fight wars but it is also dedicated to providing the world's best care for its injured combat troops. The helicopter, as Capt. Brake demonstrates above, guarantees the fastest and most comfortable "mercy missions." More than 25,000 men were "saved" by helicopters in Korea and the Army is relying more and more on rotary wing aircraft for this and other purposes.

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ing drawings of **high-capacity, simplified filter** for gasoline and aviation fuels, etc., Catalog MK-170, Public Relations Dept., Cuno Engineering Corp., Meriden, Conn. . . . **Parts catalog,** also description of service facilities for corporation and private aircraft, Supply Sales Division, Field Aviation Company Limited, Oshawa, Ont.

Sizes and shapes **of cemented oxide 0-30,** bulletin GTO-102, and specifications for **grade 330 finishing carbide,** bulletin GT-311, Carboloy Department of General Electric Co., Detroit 32, Mich. . . . **Applications of vinyl foam cushioning material,** booklet, Sales Development, Great American Industries, Inc., Rubatex Division, Bedford, Va. . . . Specifications and dimensional drawings of **three types of a. c. voltage regulators** for 30 KW engine-driven alternators, bulletin, Arga Division, Beckman Instruments, Inc., South Pasadena, Calif. . . . **Design possibilities of impact extrusion process,** booklet, Aluminum Company of America, Room 776, 1501 Alcoa Bldg., Pittsburgh 19, Pa.

## New Publications

**1955 Aircraft Yearbook**—Pub. by Lincoln Press, Inc., 1143 National Press Bldg., Washington 4, D. C. $6.00.

Contains a review of the events and developments in military and civil aviation in the nation; a directory of information sources, executives, statistics, chronology and agencies in U.S. aviation; also aircraft in production during 1955 described in detail with photographs and three-view drawings; complete chronology of aviation events from the dawn of history to the last day of the year; complete current official aviation records, the men and the machines, dates and places, precise figures.

**Parachute Flares as an Aid in Night Forced Landings**—Pub. as Aeronautics Bulletin No. 17 of the University of Illinois Institute of Aviation, Urbana, Ill. Extracted as **Aviation Safety Release No. 403** by the Civil Aeronautics Administration, U.S. Department of Commerce, which is available from the Office of Aviation Information, CAA, Washington 25, D. C. (The University's bulletin is available on request from the University or from the International Flare-Signal Division of Kilgore, Inc., Westerfield, Ohio.)

The extract covers the salient findings of the University's study on how small-plane pilots can use flares successfully for emergency night landings.

**Report of Naval Research Laboratory Progress**—Pub. monthly and available through Office of Technical Services, U.S. Department of Commerce, Washington 25, D. C. $1.25 per issue.

Articles and "problem notes" concerning NRL non-classified research and development in progress.

**Physical Metallurgy and Heat Treatment of Titanium Alloys**—Pub. by Mallory-Sharon Titanium Corp., Niles, Ohio. $1.00. 32 ill. and 10 tables.

Defines titanium alloy heat treatment and recommended practices.

**Handbook of Fastening and Joining of Metal Parts**—by Vallory H. Laughner and Augustus D. Hargan. Pub. by McGraw-Hill Book Co., 330 West 42 Street, New York 36, N. Y. $15.00. 622 pp. Many diagrams and tables.

Detailed information on standards and suitability of various methods of fastening and joining metals including dissimilar types.

**ASTM Standards on Petroleum Products and Lubricants**—Prepared by the American Society for Testing Materials Committee D-2 on Petroleum Products and Lubricants and pub. by the American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pa. $7.15 cloth covers, $6.50 paper covers. 984 pp. Diagrams.

An annual compilation, including

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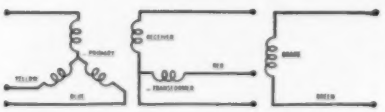

Windings are shown in electrical zero position.

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tentative and standard methods of test, specifications, definitions of terms and classifications of petroleum products and lubricants, together with related information, including the Report of Committee D-2 and many proposed methods of test.

**Spot and Seam Welding of Titanium and Titanium Alloys**—by North American Aviation, Inc., for Navy Bureau of Aeronautics. Available through Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C. $4.75. 189 pp.

Spot and seam welding of titanium and its alloys.

**Mathematics in an Industrial Economy**—Pub. by the Industrial Mathematics Society, 100 Farnsworth, Detroit 1, Mich. No charge.

Mathematics in the solution of basic problems in engineering, business management, and social and industrial research.

**Civil Air Regulations & Reference Guide for A&E Mechanics**—Pub. by Aero Publishers, Inc., 2162 Sunset Blvd., Los Angeles 26, Calif. $2.00. 120 pp.

The 13th edition. Includes reprints of regulations pertaining to airworthiness of aircraft and engines, requirements to obtain a mechanic's certificate, and requirements for establishing an authorized repair business.

**Supersonic Aircraft**—by Roy Cross—Pub. by Hanover House, 575 Madison Ave., New York 22, N. Y. $2.50. 63 pp. Many ill.

A graphic record of the direction supersonic aeronautics is taking.

**A Picture History of Flight**—by John W. R. Taylor—Pub. by Pitman Publishing Corp., 2 West 45 Street, New York 36, N. Y. $5.95. 192 pp. 648 photographs.

A study of flight from Roger Bacon to interplanetary travel.

**Boundary Layer Effects in Aerodynamics:** Proceedings of a symposium held at the National Physical Laboratory on 31st March and 1st April 1955—Pub. by Her Majesty's Stationery Office, London. £1 10s. Od. net. Diagrams and photographs.

Nine papers on boundary layer effects presented at the International Symposium on Boundary Layer Effects, and the discussions which followed them.

**Electronics**—by A. W. Keen—Pub. by Philosophical Library, Inc., 15 East 40 Street, New York 16, N. Y. $7.50. 256 pp. Photographs and many diagrams.

An introduction to electronics for the layman.


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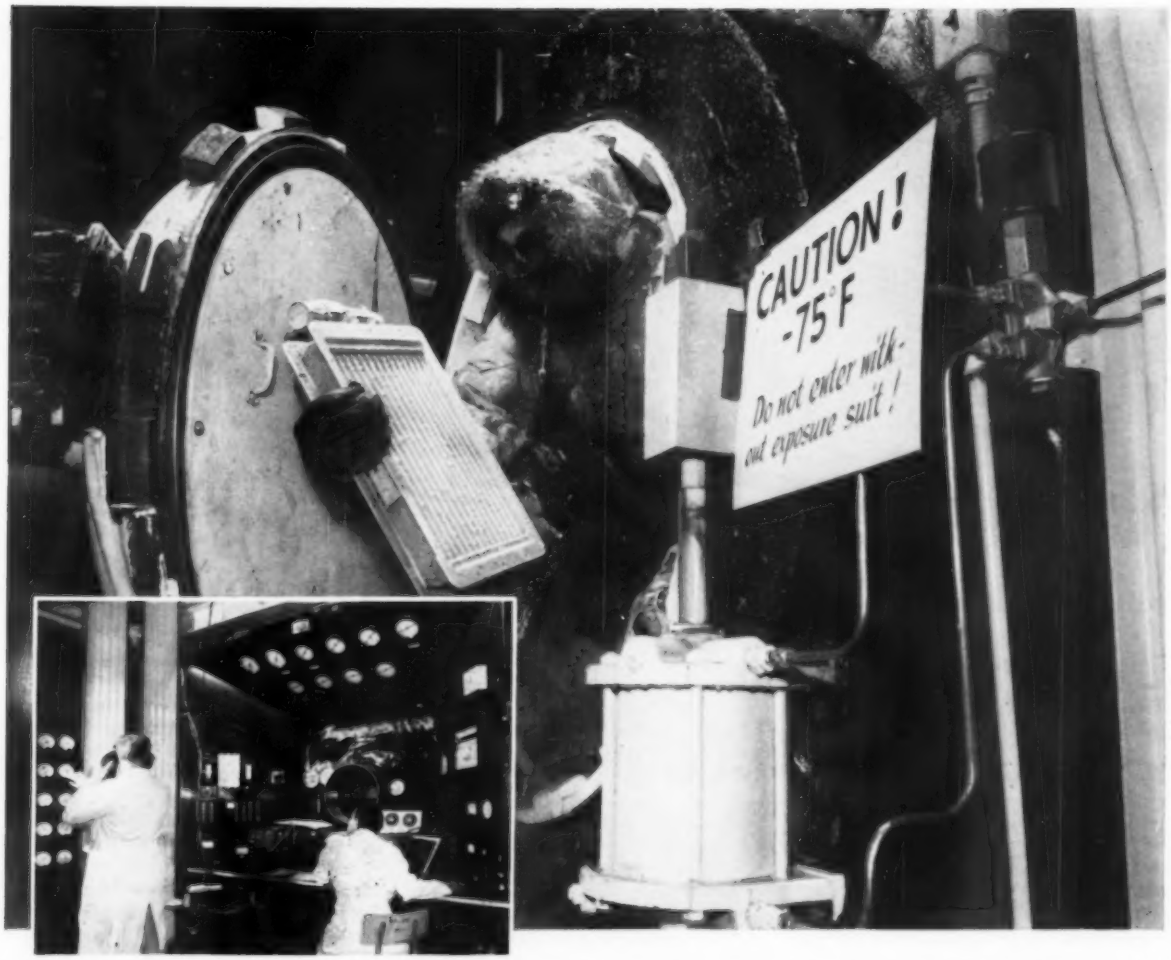


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EQUIPMENT

# Comfort in Airline Cabin Design Makes D

By George Christian

**New York**—Creating a custom interior for a modern airline transport can cost $1.5 million and involve 120,000 engineering man/hours. Airlines and airframe makers consider this cost necessary if in return they get cabins which are attractive and restful for their passengers, and cockpits in which their crews can work efficiently.

Professional designers whose advice is bought by these companies and by business plane operators work with human engineering and color psychology to provide freedom of movement and reduce fatigue for crews and passengers alike.

Among the leading designers are:

• **Henry Dreyfuss.** His latest contract is the Lockheed turboprop Electra. He also did the interior for the Lockheed Super-G Constellation, at the cost and manpower cited above. One of his first aircraft contracts was with Convair for control placement in the B-36 cockpit.

• **Walter Dorwin Teague** who designed the interior of Boeing's 707 jet transports. Teague, retained by Boeing for industrial design consultation for the last ten years, has been a consultant on such planes as the B-47 and B-52 for cockpit control and instrument placement; he also worked on the cabin of the Stratocruiser.

• **Raymond Loewy.** He presumably will handle United Air Lines' DC-8s. His firm has been retained by United for over a year and is currently giving the airline's DC-6Bs' interior the "Loewy Look." UAL says Loewy will develop interiors for their DC-7s but declines to divulge plans for the DC-8 and other future aircraft. The Loewy Look is also going into United's ticket offices located in principal cities and is reflected in male flight uniforms for this summer.

• **Charles Butler** who will plan the Model 810D turboprop-powered Vickers Viscount going to Continental Airlines. He has done the interiors of Trans Canada and Capital Viscounts. Butler also acts as consultant to Glenn L. Martin, doing design work for the inhabited areas of the XP6M SeaMaster and B-57 light jet bomber.

Douglas Aircraft Co., whose general DC-8 interior is under intensive development by the company's own Interior's Group headed by J. A. Graves, does not rely on outside designers. Graves works under E. F. Burton, chief engineer of Douglas' Santa Monica plant.

This group was responsible for DC-6 and -7 interiors. Douglas said that airlines buying its planes can bring in industrial design consultants if they wish.

### Seat Considerations

Dreyfuss believes the passenger seat to be the most important single consideration in the cabin of a transport aircraft.

A passenger is confronted with a forest of seats on entering the airliner. During most of the flight, he remains in his seat, hemmed in by the seats around him.

Dr. Janet Travell of Cornell University Medical College, worked with Dreyfuss' organization to develop the most comfortable seat possible. Dreyfuss told Dr. Travell, "Give me the comfort points and I'll take care of how it looks." A report, recently presented by Dreyfuss to Lockheed, points out the good and bad features in airline seat design.

Findings were based on actual experimentation with a seat whose principal components were adjustable in height and width. X-ray pictures were taken to show the actual position a human skeleton assumes when sitting in various positions.

The report details the shape back and seat should take, where head, neck, back, thighs and arms should be supported and what shapes these components should take.

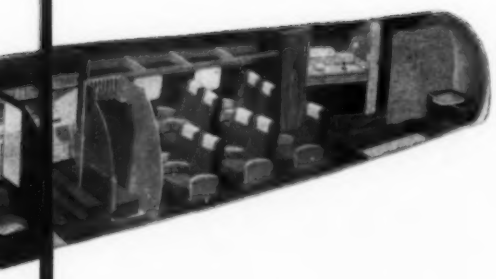
### Rooms, Not Tubes

Dreyfuss believes that people are acclimatized to rooms, not long tubes which are better proportioned to dachshunds. So he likes to divide the tube-like cabins into compartments. This, he believes, makes passengers feel at home and relax, reducing trip fatigue. Such a scheme was carried out on the Super G Connie. Dreyfuss believes the interiors of airplanes should look substantial.

To make a light-weight partition appear structurally sound, he uses dark colors to contrast with adjacent light colors, and bright colors are used sparingly for accent.

Comfort and security are sensations which cabin color and design should convey, and Dreyfuss believes "earthy," muted colors inspire such emotions. Too many colors in a cabin are confusing and should be avoided, Dreyfuss feels, and wood is out of its element in an airplane which basically is machinery.

A prime Dreyfuss tenet is, "if something operates, make its operation obvious . . . how it works should be told



**HENRY DREYFUSS** divided the Lockheed Super G Constellation cabin into compartments to eliminate the tubular fuselage effect.

**SUPER G** lounge uses leather, hand-woven fabrics, silk curtains, plastic panels.

# Dollar Sense

by its design . . . signs to explain how to work it should be unnecessary."

In application, he makes items used by all passengers, such as door knobs, water faucets and light switches, the home kind that everybody knows how to work.

The resulting weight penalty may well be off-set by the decreased cost of maintenance. Special and often puzzling fixtures are often damaged. This philosophy conforms to the thoughts expressed in Cockpit Viewpoint (AW Feb. 13, p. 116). Another Dreyfuss idea: "No Smoking" signs appear in all passenger planes; on international aircraft they appear in two or more languages creating a billboard effect.

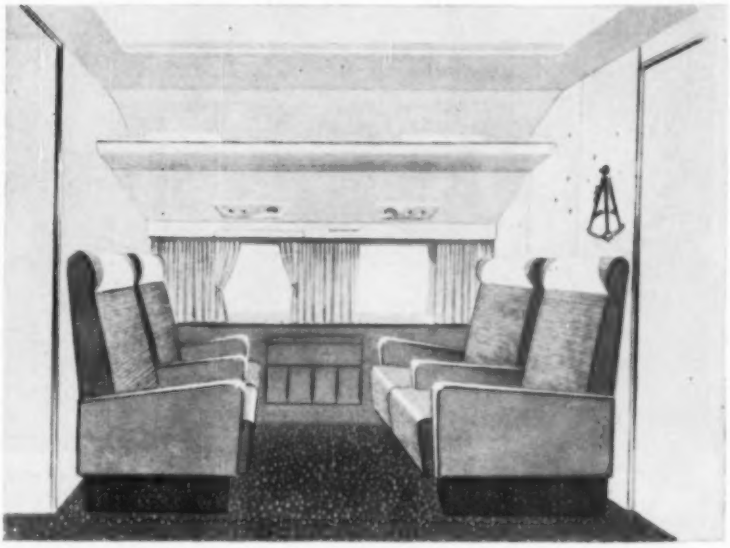
Would not an illuminated sign of a cigarette with a big "X" mark through it convey the no smoking idea to all cigarette users, regardless of nationality, asks Dreyfuss?

Basis of Dreyfuss' choice of colors for an airplane cabin is predicated, to a large extent, on his taste. If an airline already has a basic color scheme, he retains those colors, although he may vary the hues. If an airline gives him a completely free hand, he may submit alternate color schemes which he considers compatible with the climate in which the carrier operates. Terrain over which it flies also is a color criterion.

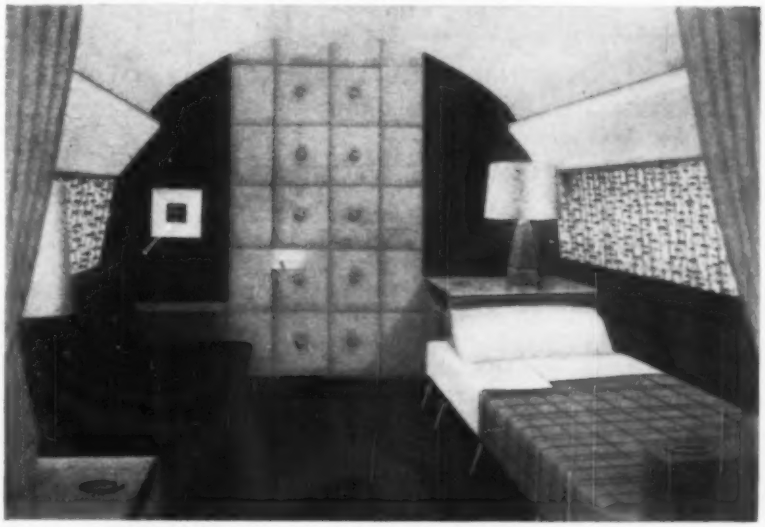
### Teague's Taste

Walter Dorwin Teague considers these to be the two dominant themes in cabin design philosophy:

• **Confidence and security** must be engendered in all passengers. This is achieved by eliminating the use of wood and what he calls "the textile

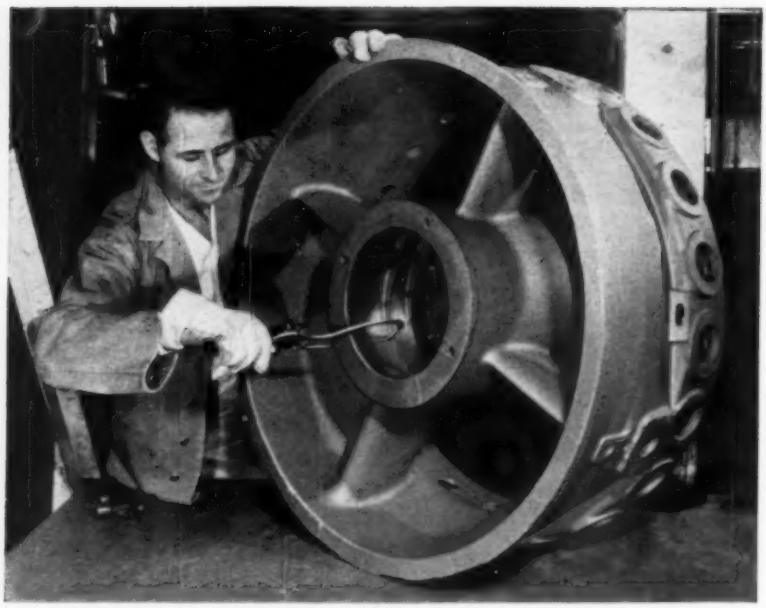


**RAYMOND LOEWY** designed this forward cabin for United Air Line's DC-6B.



**DC-3** executive aircraft interior proposed by Charles Butler.

# QUALITY MAGNESIUM CASTINGS



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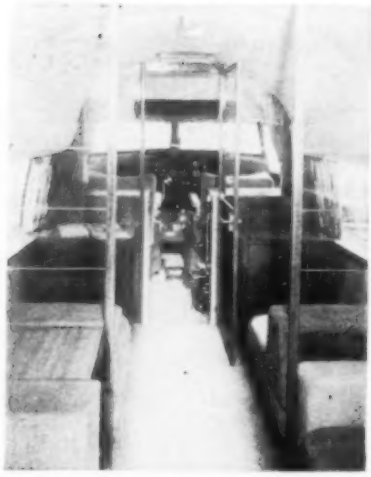

**BUTLER designed cabin on executive DC-3 provides unobstructed forward view.**

look." Instead, he uses metals and synthetic materials which convey the impression of solid walls and structural soundness, in harmony with the sleek, solid, metallic exterior look of an airplane.

• **Gaiety and pleasure sensations** can be aroused in passengers by using "airborne colors"—light, high-key colors which give the sensation of being carried lightly aloft, of floating. Such colors help relieve any feeling of monotony. Teague thinks that there should be no restriction in the colors used in aircraft interiors. Colors were often limited by maintenance considerations. Old fabrics were hard to clean or showed up scuff marks easily. Teague does not believe in letting the terrain over which a plane flies influence the cabin's color scheme; the ship will be too high to let terrain character affect passengers.

He believes that any item of cabin equipment should be capable of being cleaned or replaced in a matter of minutes.

A seat cushion with a cigarette hole burned should be easy to replace. Teague said that he knows through experience that certain combinations of form and color, of light and sparkle, have universal appeal.

The 707's cabin is being done by Teague's Boeing office in Seattle under Frank Del Giudice.

### Loewy Looking

A. B. Barnhart, partner of Raymond Loewy Associates, told Aviation Week that the essential ingredients which his firm instills into an airliner cabin are charm and gaiety. "Use light, airy colors and make a cabin look comfortable," he says.

Other points: Loewy likes to stay away from metallic as much as possible to create a "soft look." All passenger services should be featured ra-


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*The next 135 words of this advertisement taken from Bell Engineers' letters*

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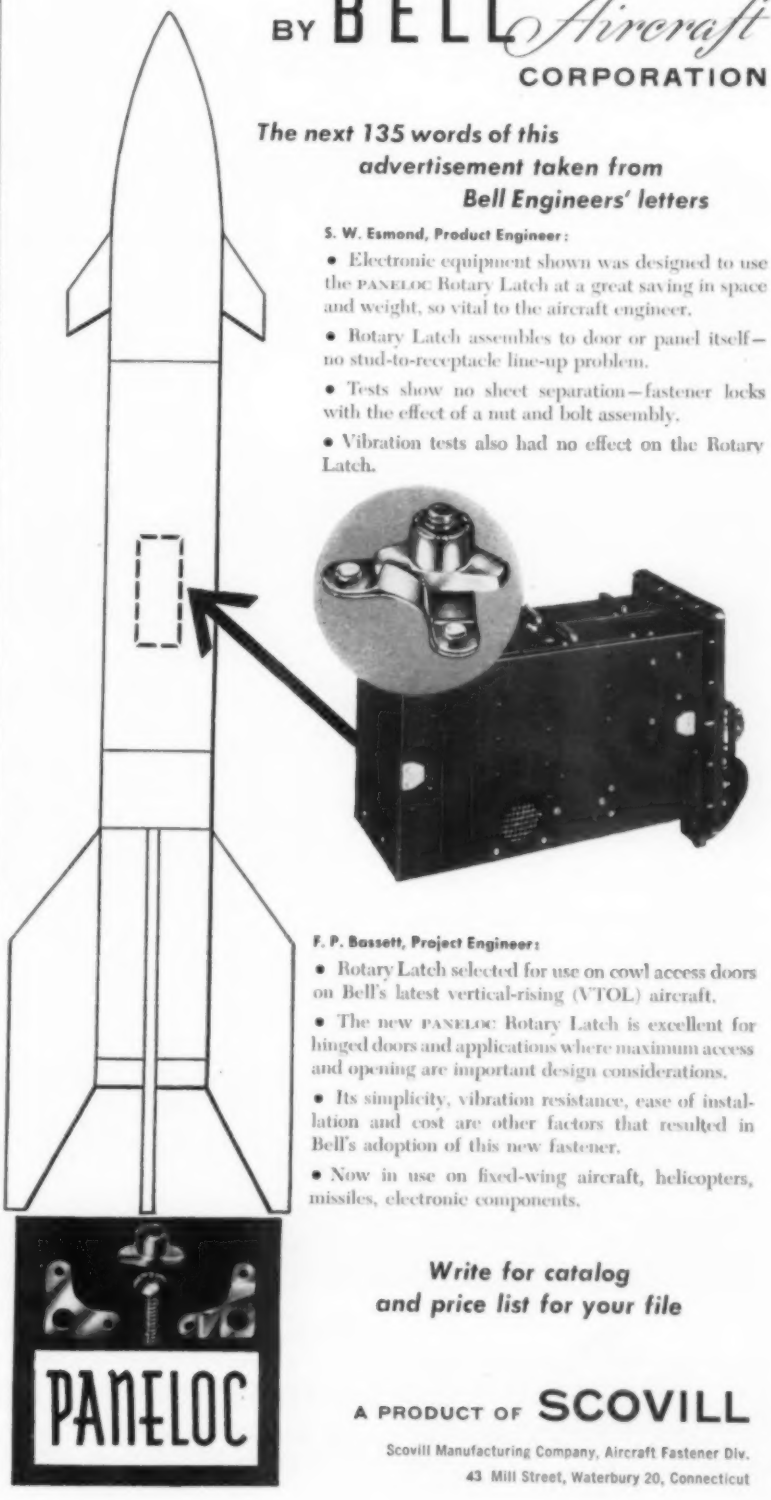
• Tests show no sheet separation—fastener locks with the effect of a nut and bolt assembly.

• Vibration tests also had no effect on the Rotary Latch.




**F. P. Bassett, Project Engineer:**

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• The new PANELOC Rotary Latch is excellent for hinged doors and applications where maximum access and opening are important design considerations.

• Its simplicity, vibration resistance, ease of installation and cost are other factors that resulted in Bell's adoption of this new fastener.

• Now in use on fixed-wing aircraft, helicopters, missiles, electronic components.

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SPECIALISTS IN AIRCRAFT LANDING GEAR

ther than hidden. They must be functionally grouped so that a passenger can quickly find a right button or switch. One innovation Loewy is bringing to airliner cabins is lights which passengers will be able to focus to their individual desires.

On United's DC-6Bs, Loewy uses rose, light blue and off-white as dominant colors, with accents of gold and coral.

Each cabin has its own distinctive styling. The lounge ceiling is sheathed in white leather, arranged in vertical pleats. An octant and compass, symbolic of navigation, are tooled in gold in the white leather. Seats of coral leather enclose a circular table edged in brass.

UAL's DC-7s will follow the same interior color scheme and design.

Two DC-6Bs have been converted by UAL's satellite overhaul base at Denver.

### Butler's View

Charles Butler said, "Until quite recently, passenger aircraft interiors looked like the inside of a mailing tube. Color schemes, likely as not, followed the whims of an airline president's wife. . . . This day has passed. . . . To make the flying public feel at home in a plane, to turn the 'first rider' into a 'repeat rider', airframe companies and airlines are now seeking the services of professional design consultants."

Here is the trend Butler sees: Commercial and executive aircraft interior design philosophies, once very different, merging into a common desire for a look of "luxurious spaciousness."

On military aircraft, where inhabited-area layout used to be quite haphazard, the services are now stressing the need for human engineering and color psychology. First formula is aimed at designing maximum utility into military planes' inhabited areas; the second involves the use of restful color schemes which will help keep crew fatigue at a minimum.

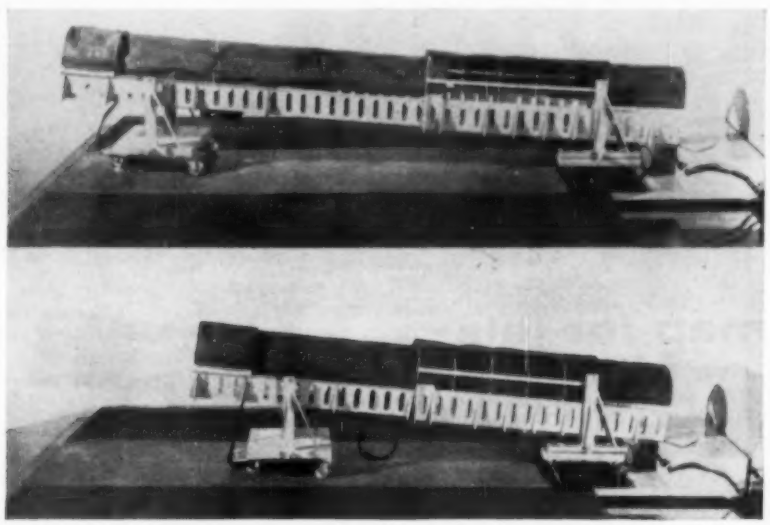
When the passenger first boards the plane, its interior must be designed to "invite him in." Then, when he is seated, layout and color of his immediate surroundings must make him feel relaxed and at ease. It should soothe any fears and create an atmosphere of comfort.

To avoid "institutional" interiors, Butler avoids "dirty, uninteresting, poorly contrasting" colors such as dark blues, browns, and greys. He eliminates what he calls "those odious color combinations—such as purple and yellow—which hem you in."

Instead, he uses tints which suggest spaciousness and bouyancy, such as rose-beiges and soft greens, accented by hues like bottle green.

### Warm Metal

Butler uses warm metal tones, achieved by anodizing, to avoid the bleakness of bright, bare metal. This allows him to blend cabin hardware,



## USAF Orders New Cargo Loader

Aerobridge, a new loading device to speed cargo transfer between plane and air freight terminal, will be supplied to the Air Force by Lockheed Air Terminal, Burbank, Calif. First of two units ordered is expected to go into operation at Travis AFB, near San Francisco. Aerobridge is a telescoping, hooded ramp supported by hoists mounted on dollies at either end. Each end of the ramp is independently adjustable between heights of 4 and 10 ft. The unit is 64 ft. long but can be extended to 84 ft. The ramp can be rotated and moved freely alongside a cargo dock. The dockside dolly can be mounted on rails or on solid rubber wheels where trackage is not employed.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Sleek successor to the famed '240' and '340', Convair's new 440 *Metropolitan* incorporates the latest features for passenger comfort and safety.

Again, as in the two earlier ships, dependable Teleflex controls are aboard, right at the pilot's fingertips, ready to provide positive, instantaneous response.

Four lightweight Teleflex mechanical remote controls operate the—

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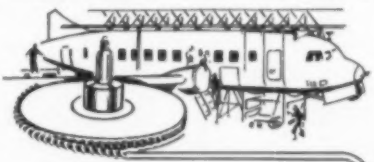
- ***EMERGENCY CABIN PRESSURE DUMP** — Teleflex operates mechanism providing rapid drop of cabin pressure in case of emergency*



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Teleflex is a compact, single-path control linkage that follows any desired devious route. A flexible, rack-like cable, operating through precisely drawn conduit, transfers linear, arc, or rotary controlling motion as tension or compression push-pull motion. Wherever rotary motion (up to a full revolution or more) is required, the cable's helical outer wrap meshes with and turns a hobbed control wheel of the required size.

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MECHANICAL CONTROLS

LINKAGES MECHANISMS

*TACAN unit shown with covers removed; plane is a composite model.*

# 78-~~page~~ tube road map for jets

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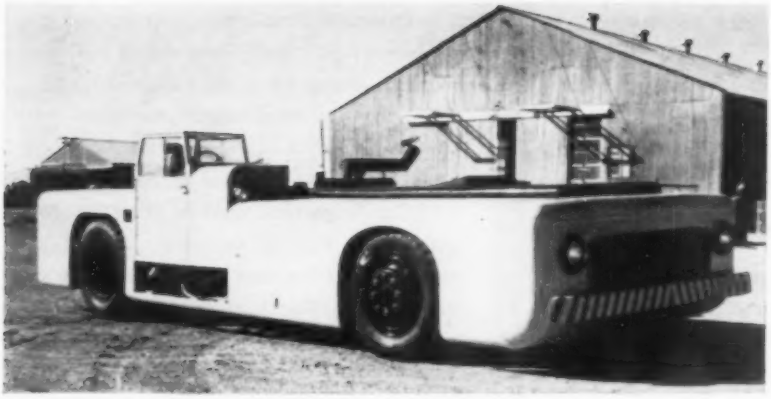

## New Service Unit for RB-66

A new aircraft ground service unit, labelled the MSV-4, has been especially designed and built by Gremco, Inc., for the Douglas RB-66 twin-jet reconnaissance plane.

The 14-ton vehicle can supply both a.c. and d.c. electrical power, 3,000 psi. hydraulic power at 12-15 gpm., and 138,000 Btu./hr. of cooling to service aircraft on the ground.

The low-slung machine is only 54 in. high, eight feet wide and 20 ft long. It is powered by a tank-type, 375 hp. engine, and has a top speed of 12 mph. The manufacturer says the vehicle can accelerate from a dead stop to full speed while towing aircraft weighing up to 600,000 lb.

Designed to be operated by one man, the machine features a telescoping driver's compartment which can be hydraulically raised for added visibility or lowered for greater under-wing clearance. The canopy is transparent on all sides. The vehicle is manufactured at Gremco's Ft. Worth plant, and is in service at Douglas' Tulsa, Okla. factory.

such as service panels and switches, into the plane's soft, cloth background.

Contrary to two of his contemporaries, Butler likes to use natural wood surfaces because he feels they tend to give a relaxing atmosphere to a cabin.

New plastics provide an interesting and almost unlimited lightweight medium for cabin decoration. Any number of textures, grains, finishes and colors are available.

In executive aircraft, the problem is very much the same—make the occupants feel relaxed and comfortable in a cabin which breathes spaciousness and luxury.

### Color & Style

Here is how Butler approaches the task of what he calls "putting color and style in the sky."

"We have a yardstick for everything we do. We carefully study an airline's route structure since the cabin color scheme chosen will, to a large extent, be predicated on the color make-up of the terrain."

Other items considered in determining the final color pattern include mood and climate of the airline's routes and character of average passenger carried.

Basis of his color choice is knowledge of the psychology of color and long experience in its practical application. Tested color ideas, he says, allow a specialist to evolve cabin color schemes and layouts which should produce in passengers the desired reactions of relaxation and at-homeness, and quell any sensations of insecurity or claustrophobia.

### Implementation

After completing his study of an airline's route structure, Butler follows these general color philosophies.

Color schemes for aricraft flying Northern routes should use the greens, browns and maple reds of Northern forests.

Southern route carriers should blend their planes' interiors with the blues, aquas and soft greens of tropical seas and skies.

North-and-South airlines, such as Capital, which flies from sunny New Orleans to bitter Sault Ste. Marie, should have cabin color schemes which strike a happy medium and humor all climates.

Another important criterion of cabin color is tuning the personality of the interior to the mood of the plane's route. Some aircraft fly "holiday routes" where the bulk of the passengers are either going to or coming from a holiday.

Their cabins should reflect the mood with festive designs—golds, blues, and yellow—such as Eastern Air Lines' "Golden Falcon" interiors, which were fashioned by Harley Earl, vice president in charge of styling for General Motors. (Reason is the close personal friendship which has existed between Eastern's Rickenbacker and GM's Earl since the days of EAL's predecessor


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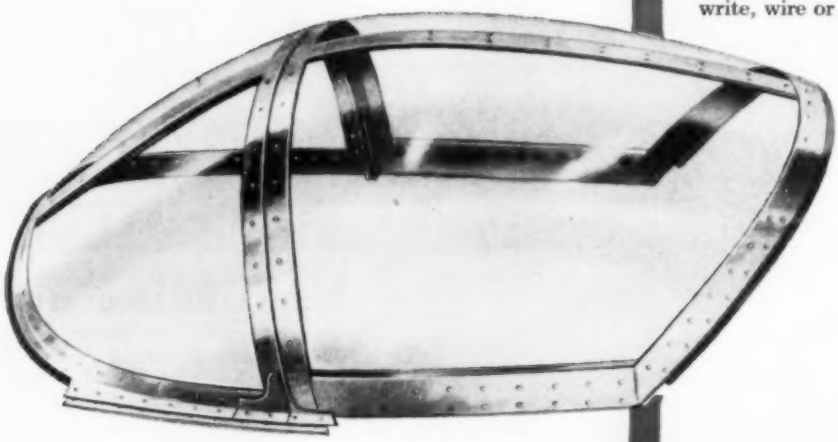

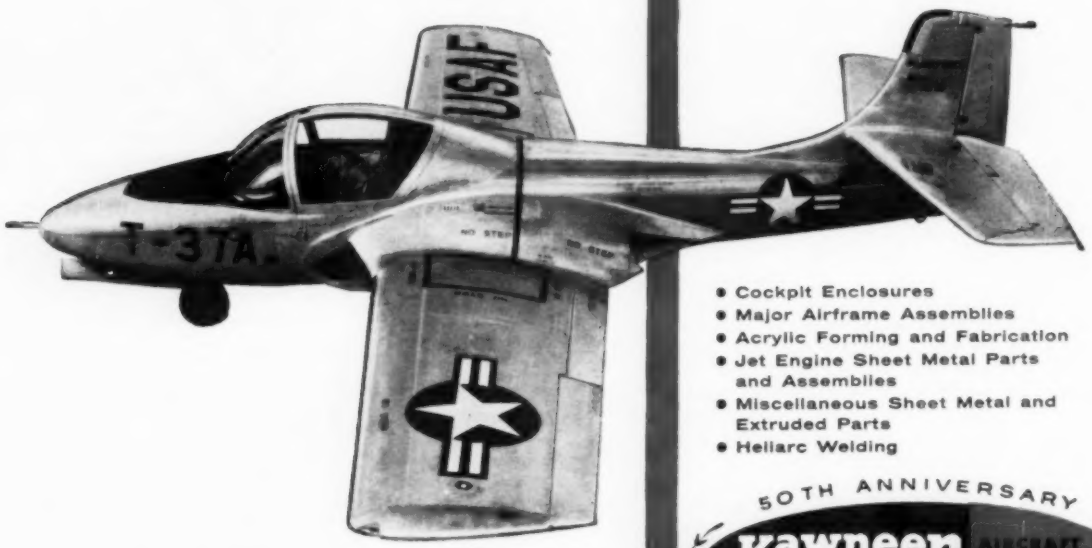


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company, Eastern Air Transport, Inc. Rickenbacker reportedly paid nothing for Earl's Golden Falcon work).

Planes used on flights which are predominantly associated with business, such as trans-continental runs should have more conservative interior designs.

### Success Story

A check with some of the airlines flying custom-interior airplanes underlined the successes achieved.

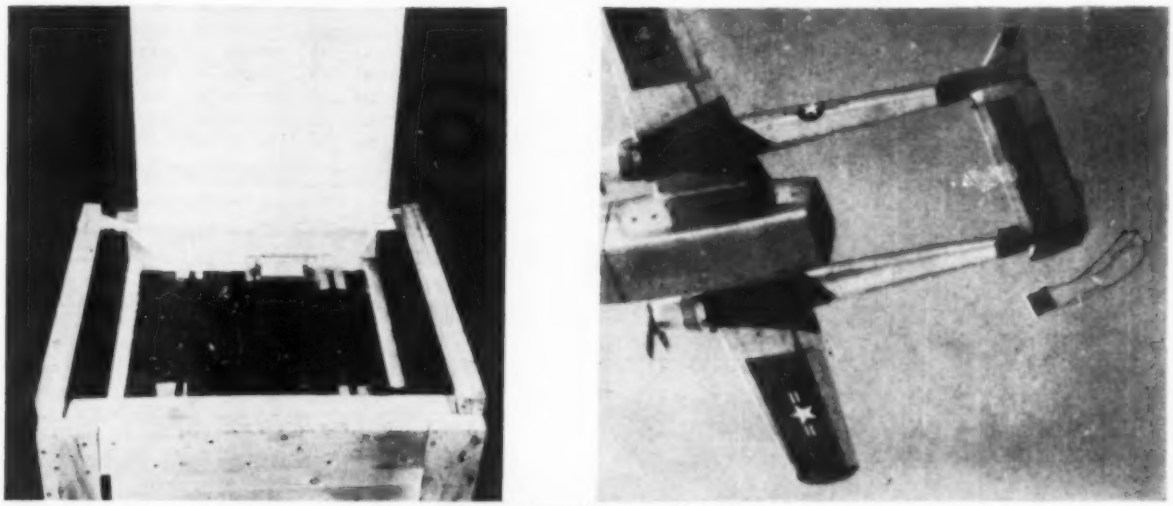
Trans World Airlines has a long list of passenger compliments on the Dreyfuss interior. Among them, "the four rooms give you a feeling of privacy" and "luxury surpasses anything I've ever seen."

Capital Airlines, although having relatively short experience with Butler-designed Viscount interiors, recorded these expressions from passengers, "this is the nicest room I have ever seen" and "the pleasant surroundings relieved my usual boredom and helped shorten the trip."

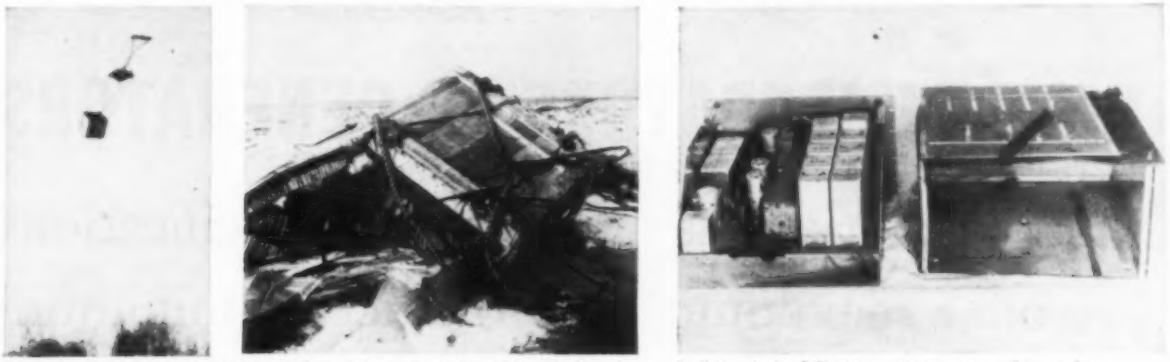
Both airframe manufacturers, Lockheed and Vickers, indicate that they are happy with their decisions to give to outside design experts the task of developing the layout and color schemes of their latest airliners.

Butler is design consultant for L. B. Smith for whom he recently completed the Tropicana executive DC-3 (AW Dec. 5, p. 57).

# USAF Tests Free-Fall Air Drops



**WOOD BOX** (left) can be made by any carpenter; it has been dropped from a C-119 (right) at airspeed of about 150 mph.



**RETARDER PLATES** slow package to about 50 mph. (left); although box is smashed (center), delicate contents are undamaged.

Free-fall air drop may soon become standard operating procedure for delivering electronic equipment to the vital defense communications network established in the Arctic, according to Cargo Packers, Inc.

A method for protecting delicate electronic packages against the jarring impact of a free fall has been developed by the Brooklyn, N. Y. company. The boxes are dropped on Arctic ice from an altitude of 1,000 ft.; fall is retarded by two plywood, air-drogue plates.

Advantage of the free-fall drop is that equipment can be pin-pointed on the ground much more easily than material parachuted to earth. Canopys can be caught up by strong Northern Williwaws and drift the equipment into inaccessible terrain.

The box, which contains no strategic materials, can be made in any carpenter shop. Its cushioning effect is derived from its design—it is possible to orient the package to land on a corner for maximum energy absorption—while plastic and paper packing give further protection to assure delivery of the electronic equipment in serviceable condition.

The same free-fall technique is readily adaptable to dropping emergency supplies to flooded or storm-stricken areas or to help fight forest fires.

In tests at Wright-Patterson Air Force Base last winter, the shock-absorbing package was used to protect a 125 lb. radio transmitter dropped from a C-119 cargo plane flying at 150 mph. Its drogues slowed the package to about 50 mph. at impact on hard, icy ground without damage to the radio equipment, according to the packing company.

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|---|---|---|---|---|---|---|---|
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| *28B23-1 | 20 | 4 | 11 | 8.25 | 4800-7200 | 65 | AND 10262 XII-A |
| *28E17-1 | 30 | 8 | 14 | 8.25 | 5700-6300 | 69 | AND 10266 XVI-A |
| *28E14-1 | 40 | 5 | 14.5 | 9.25 | 5700-6300 | 83 | AND 10266 XVI-A |
| *28E15-1 | 60 | 6 | 16 | 9.25 | 5700-6300 | 103 | AND 10266 XVI-A |
| 28E19-1 | 10 | 4 | 7 | 6.5 | 7600-8400 | 30 | AND 10262 XII-A |
| 28E19-3 | 10 | 4 | 7 | 6.5 | 7600-8400 | 31 | New 9" Flange |
| 28E20-1 | 20 | 6 | 8.5 | 6.5 | 7600-8400 | 45 | AND 10262 XII-A |
| 28E20-3 | 20 | 6 | 8.5 | 6.5 | 7600-8400 | 46 | New 9" Flange |
| 28E21-1 | 30 | 10 | 12.4 | 6.5 | 7600-8400 | 60 | AND 10262 XII-A |
| 28E21-3 | 30 | 10 | 12.4 | 6.5 | 7600-8400 | 61 | New 9" Flange |
| **28E10-1 | 9 | 6 | 8.6 | 6.5 | 7600-8400 | 39 | AND 10262 XII-A |

*These generators include integral fan permitting full load continuously up to 80°C at sea level with no additional cooling.

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All generators have been designed to MIL-G-6099 and MS-33542, which specifies cooling air of 120°C at sea level, 40°C at 50,000 ft., and −12°C at 65,000 ft., and will deliver full-rated load under these conditions.

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PLASTIC FILM, which protects optical surface during forming, peels off easily.

## New Canopy Process Eases Design Problems

**San Fernando, Calif.**—A new process permitting contact-forming of aircraft acrylic canopies and other transparent parts to any desired shape has been developed here by Plastic Age Aircraft Corp.

First production application of the process will be on canopies for the Lockheed F-104A and T2V-1.

Known as Optipeel, the process gives the designer wide latitude in the design of canopy configurations without sacrificing optical properties, according to Plastic Age's president, J. A. Kramer.

The process permits the forming of shapes which cannot be free blown because of their contours, and yet affords the optical properties obtained with free-blown forming. It also eliminates mark-off (imperfections) and distortion frequently encountered in grease and dry contact forming, Kramer says.

### How it Works

In the Optipeel process, the plastic sheet to be formed is coated on one side with a soft plastic film known as Optijel. This coating becomes an integral part of the plastic sheet for the forming operation. After the sheet is heated for forming, the coated side of the sheet is placed against the die surface.

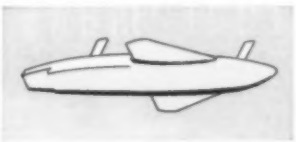
Because Optijel coating is soft, it conforms to any die imperfections and absorbs any impurities on the die surface, preventing them from touching the surface of the acrylic sheet.

This allows the sheet to be formed without surface marring from the die.

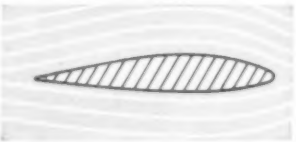
Since there is no movement between the coating and the sheet during the forming operation, any impurities between the two also do not cause any marring.

After the sheet has cooled, the

Yes even ice- and snow-covered areas can be utilized as landing fields for aircraft designed to include the Pantobase landing system. A product of Stroukoff research and development, Pantobase will permit landings and take-offs from snow, ice, sand, water and unimproved terrain, thereby extending the operational capabilities of the aircraft and reducing the need for conventional airports in many remote and previously inaccessible parts of the earth's surface.



**Pantobase**—When designed into an aircraft the Pantobase system enables the plane to land and take-off from many types of surface without changes of additional landing equipment.



**BLC**-Boundary layer control as developed by Stroukoff increases the effective lift and delays stalling of the wing, thereby reducing required speeds and distances for take-offs and landings.

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Optijel coating is peeled off, leaving the surface of the sheet unblemished, with optical values fully preserved, Kramer says.

Plastic Age also uses free-blown and grease and dry forming techniques for making canopies. The free-blown method is restricted to canopies which have a spherical contour.

### Conversion Planned

The company intends to replace both its grease and dry forming methods with the new Optipeel process as quickly as the conversion can be made. Kramer points out these disadvantages in the grease and dry forming procedures:

- **In dry forming,** mark-off is caused by impurities and irregularities on the protective material used between the sheet and the die. Relative motion between the sheet and protective material increases the possibility of mark-off and scratches on the sheet.
- **In grease forming,** impurities on the die or in the grease can cause mark-off. Also, irregularities in the grease surface frequently cause optical distortion.

If the sheet is being grease-formed by a vacuum process, the vacuum hole in the die also tends to leave a distortion, known as "bull's eye," in the formed sheet.

By comparison, the Optijel coating adheres firmly to the sheet during the forming operation and acts as a protective cushion to prevent marring by impurities and die imperfections, Kramer says.

## New J57 Starter Tested on 707

A new fuel-air starter, which starts a P&WA J57 turbojet on Boeing's prototype 707 jet transport in 20 seconds without help from ground power equipment, has been flying on the 707 for the last nine months and logged over 250 starts.

Made by Hamilton Standard and labeled FSA 700-4, it is installed on the 707's number one J57. It is operated from compressed air, released from a bottle, which is mixed with JP-4 fuel from the plane's standard supply. The mixture is ignited and the resultant energy spins a small turbine at high speed. Rotation of the turbine is geared down to crank the J57.

The compressed air bottle's capacity is sufficient for three starts. It is recharged during flight from a small, electrically-driven pneumatic compressor.

For increased reliability, the starter is designed to operate on air alone, but this requires more air than a fuel-air start. Once the first J57 is running, air is bled from its compressor to start the remaining three powerplants.

**FUEL-AIR** combustion starter exhaust port (arrow) on Boeing 707's No. 1 Pratt & Whitney J57 engine.

## Cold Cathode-Type Tube Used In Timing Control

Precise timing control for electrical resistance welding machines, which counts cycles of line frequency, has been developed by Sciaky Bros. Heart of the new machine is a cold cathode-type tube, the Dekatron, capable of counting from one to ten. By adding a decade Dekatron, the count can be increased to one hundred. A third Dekatron will push the count to one thousand, the maximum the machine will handle. Sciaky also has developed a new rectifier to use with the machine.


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use HELI-COIL* Screw-Lock Inserts

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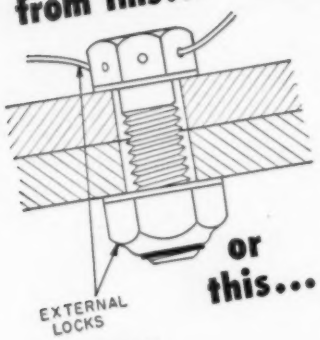


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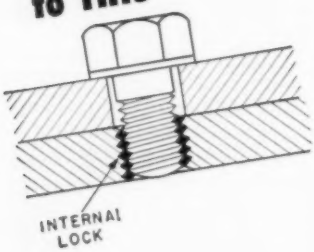


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For years designs requiring lock nuts or lock wiring have plagued designers with problems of space, weight and costs. Each lock nut, even a small one, takes space, has weight and costs money. Every bolt locked with wire requires a through hole in the head, positioning and wiring. The simplicity of many a superior design has been lost due to these cumbersome methods of fastening.

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IN CANADA: W. R. WATKINS CO. LTD., 41 Kipling Ave. S, Toronto 18, Ont.


# Study Sun Radiation For Weather Planning

Effect of changes in the character of solar radiations upon terrestrial weather are being studied by the University of Colorado High Altitude Laboratory at two-mile-high Climax, Colorado.

The four-year $150,000 long-range study is being financed from private sources. These include airlines, oil companies, and other American corporations, foundations, and individuals with special interest in improved weather predictions.

Dr. Walter Orr Roberts, director of the observatory, said that "Research work of the past three to five years strongly indicates that solar radiation changes can create sudden changes in worldwide weather patterns. We're beginning to learn how and why these occur."

### New Justification

Recent advances, particularly in knowledge of ultra-violet, X-ray and charged-particle emissions of the sun "justify a more vigorous attack" on the problem of their meteorological effects, he said.

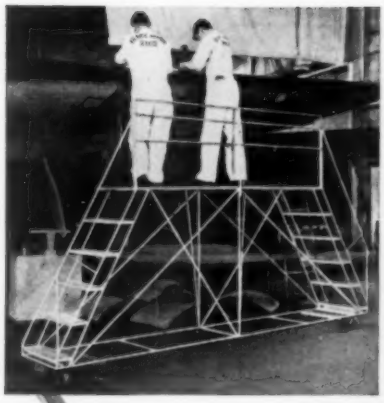
Weather has been considered to be mainly the result of uneven heating of the earth's surface due to changes in the attitude of its axis, differences in the angle of impact of solar rays in different latitudes, differences in the nature of the surface, and other local influences.

Dr. Roberts said the observatory was interested in the basic science of the problem of high frequency and particle emissions but that highly practical results of applying the science to weather forecasting are now becoming apparent.

### Four Year Check

Roberts said the research program aims to develop enough facts in the next four years to "make possible the forecasting of rainfall over such large areas as the so-called dust bowl or the central Rocky Mountains. By the end of that time we hope to know definitely if our studies of solar behavior can be applied directly and reliably to weather forecasting. There is good reason to hope that new forecasting tools will result."

Funds are being contributed to the Solar-Terrestrial Research Institute of the High Altitude Observatory by American Gas Assn., Shell Development Co., Standard Oil Co. (Ind.) Foundation; Esso Research and Engineering Co., Socony Mobil Oil Co., Gulf Research and Development Co., Trans World Airlines, United Air Lines, Continental Air Lines, American Airlines and Laurance Rockefeller.



# airplane maintenance time cut 20% with BALLYMORE WORK PLATFORMS

At Atlantic Aviation Service, New Castle, Delaware, they find that by using Ballymore Work Platforms for reaching high levels on larger planes they save money and cut maintenance time 20%. The platforms are simple to mount and provide easy movement around the engine or other parts of the plane being repaired. And mechanics can take all their tools with them to eliminate running up and down.

Atlantic Aviation Service uses several types of Ballymore work platforms, either singly or grouped together so that a number of service men can work at the same time. They find them particularly effective for engine repairs, painting, putting de-icer boots on wings and similar jobs.

All welded steel construction, the platforms roll easily into position on smooth-running, ball-bearing casters and lock firmly to floor by a treadle system. No sway or "kick-out". Handrails and guards help prevent falling, safety grids on steps and platform help ward off slipping. Write today for more information to Ballymore, Company, Wayne 21, Pennsylvania.

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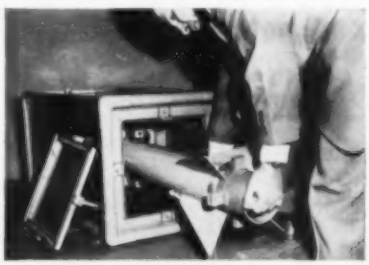

SIDEWINDER

SPARROW

# LINK jet simulators will train UNITED AIRLINES DC-8 pilots and crews

Link Aviation, Inc. has been selected by United Airlines to produce their first jet simulator for the new Douglas DC-8 jet transport.

With 30 of these famous aircraft soon to be in service, United will use the Link jet simulator to help pilots and crews get the "feel" of jet flight.

By reproducing the flight characteristics and the crew compartment of the DC-8 exactly, the Link electronic simulator will make it possible for United personnel to "fly" on the ground in conditions duplicating every detail encountered in the air. Crew coordination, radio procedures, landings and takeoffs, emergency conditions—all can be practiced.

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# Stock Transactions

Washington—Earl F. Slick, a director of Slick Airways, Inc., has acquired 47,619 shares of common stock, making a holding of 151,001 shares, reports Securities and Exchange Commission.

Other transactions for the period Feb. 11 through March 10:

**Admiral Corp.** Acquisition of 2,000 capital shares by Ross D. Siragusa, officer and director, making a direct holding of 245,467 and an indirect holding of 69,808.

**Air Associates Inc.** Acquisition of 100 common shares by C. Kenneth Baxter, director, making a holding of 6,000; acquisition of 100 common shares by Donner Trusts, making a holding of 150,684.

**American Airlines, Inc.** Acquisition of 500 common shares by Walter W. Candy, Jr., director, his total holding.

**Bell Aircraft Corp.** Acquisition of 100 common shares by Lester P. Faneuf, officer and director, making a holding of 300.

**Bellanca Aircraft Corp.** Acquisition of 1,000 and disposal of 400 common shares by John C. Redmond, officer and director, making a direct holding of 2,100 and an indirect holding of 400.

**Bendix Aviation Corp.** Disposal of 100 common shares by Charles Hummel, officer, leaving a holding of 814.

**Borg-Warner Corp.** Acquisition of 600 common shares by Charles S. Davis, Jr., director, making a direct holding of 8,600 and an indirect holding of 300; acquisition of 120 common shares by H. H. Gehlbach, officer, making a holding of 720; disposal of 600 common shares by Mathew Keck, officer, leaving a holding of 1,968; acquisition of 1,560 common shares by Robert W. Murphy, officer and director, making a holding of 1,786.

**Braniff Airways, Inc.** Disposal of 300 common shares by C. G. Adams, officer and director, leaving a holding of 11,759.

**California Eastern Aviation.** Acquisition of 493 common shares through incentive compensation plan by Glenn A. Cramer, officer, making a holding of 518; acquisition of 493 common shares through incentive compensation plan by Thomas O. English, officer, making a holding of 3,118; acquisition of 1,100 and disposal of 800 common shares by J. W. M. Haight, officer and director, leaving a holding of 8,175.

**Capital Airlines, Inc.** Disposal of 250 common shares by J. H. Carmichael, officer, leaving a holding of 2,348; disposal of 1,012 common shares by J. D. Stetson Coleman, director, leaving a holding of 4,500.

**Cessna Aircraft Co.** Acquisition of 200 capital shares by Roy C. Russell, director, making a holding of 400; disposal of 1,600 capital shares by Dwane L. Wallace, officer and director, leaving a holding of 60,120.

**Chance Vought Aircraft.** Acquisition of 400 common shares by Charles J. McCarthy, officer and director, making a holding of 800.

**Chrysler Corp.** Disposal of 200 common shares by C. L. Jacobson, officer, leaving a holding of 1,308.

**Continental Air Lines.** Disposal of 2,400 common shares by Lawrence C. Ames, leaving a direct holding of 15,000 and an indirect holding of 2,000.

**Curtiss-Wright Corp.** Acquisition of 300 common shares through exercise of option by Jack O. Charshafian, officer, making a holding of 300; acquisition of 500 common shares through exercise of option by Thomas C. Coyne, officer, making a holding of 800; acquisition of 2,000 common shares through exercise of option by Frank H. Hankins, Jr., officer, making a holding of 2,200; acquisition of 10,000 common shares through exercise of option by George R. Hill, officer and director, making a holding of 12,700; acquisition of 7,500 common shares through exercise of option by Roy T. Hurley, officer and director, making a direct holding of 13,500 and an indirect holding of 100; acquisition of 500 common shares through exercise of option by Stanley R. Kurzina, Jr., officer, making a holding of 1,500; acquisition of 1,000 common shares through exercise of option by Frank W. Mencik, officer, making a holding of 1,100.

**Douglas Aircraft Co., Inc.** Disposal of 600 capital shares by Kenneth G. Farrar, officer, leaving a holding of 300; disposal of 300 capital shares by Harold G. Hynd, officer, leaving a holding of 600.

**Flying Tiger Line, Inc.** Acquisition of 1,500 common shares by Robert W. Prescott, officer and director, making a holding of 4,028.

**General Dynamics Corp.** Disposal of 100 common shares by William T. Bresnahan, officer, his total holding; disposal of 100 common shares by LaMotte T. Cohu, director, leaving a holding of 1,200; acquisition of 1,000 common shares by Robert B. Watts, director, making a holding of 1,748.

**General Electric Co.** Acquisition of 3,225 common shares through exercise of option by Henry V. Erben, officer, making a holding of 11,565; disposal of 500 common shares by Philip D. Reed, director, leaving a holding of 4,800; disposal of 2,070 common shares by Chauncey Guy Suits, officer and director, leaving a holding of 25; acquisition of 1,695 common shares through exercise of option by William C. Wichman, officer, making a holding of 2,603.

**Hoffman Electronics.** Disposal of 250 common shares by Joseph S. McGee, officer, his total holding.

**Lear, Inc.** Acquisition of 291 common shares by Roy J. Benecchi, officer and director, making a holding of 1,881; acquisition of 314 common shares through bonus


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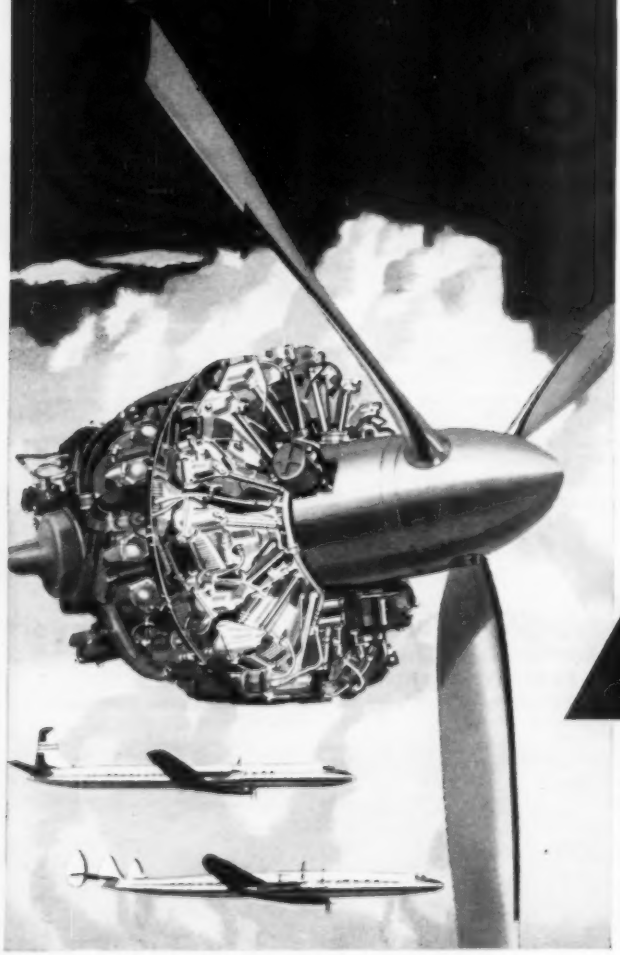

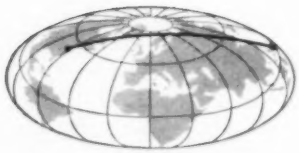

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by C. J. Breitwieser, officer, his total holding; acquisition of 2,949 common shares by Andrew Haiduck, officer, making a holding of 5,171.

**Lockheed Aircraft Corp.** Disposal of 424 capital shares by Robert E. Gross, officer and director, leaving a holding of 71,000.

**Glenn L. Martin Co.** Disposal of 1,000 common shares by George T. Willey, officer, leaving a holding of 6,350.

**McDonnell Aircraft.** Disposal of 2,133 common shares by Garrett C. Covington, Jr., officer, leaving a holding of 1,000.

**Minneapolis-Honeywell** Regulator Co. Disposal of 1,300 common shares by Richard P. Brown, director, leaving a holding of 72,897; disposal of 1,210 common shares by C. B. Sweatt, officer and director, leaving a direct holding of 77,720 and an indirect holding of 9,230.

**North American Aviation.** Disposal of 450 capital shares by Raymond H. Rice, officer and director, leaving a holding of 100.

**Northeast Airlines, Inc.** Acquisition of 5,000 common shares by Hamilton Heard, officer, his total holding.

**Northrop Aircraft, Inc.** Disposal of 1,000 common shares by Earle M. Jorgensen, a director, leaving no holding.

**Pacific Northern Airlines.** Acquisition of 900 common shares by Max B. Kirkpatrick, director, making a holding of 2,901.

**Pan American World Airways, Inc.** Acquisition of 3,750 common shares through exercise of option by Henry J. Friendly, officer and director, making a holding of 5,805; acquisition of 1,875 common shares through exercise of option by John C. Leslie, officer and director, making a holding of 5,144; acquisition of 9,375 common shares through exercise of option by J. T. Trippe, officer and director, making a direct holding of 47,789 and an indirect holding of 40,000.

**Republic Aviation Corp.** Disposal of 102 common shares by Frederic G. Coburn, director, leaving a holding of 300.

**Ryan Aeronautical Co.** Acquisition of 200 common shares by Emtor, Inc., beneficial owner, making a holding of 87,700.

**Sperry Rand, Inc.** Disposal of 3,000 common shares by Allen N. Seares, officer, leaving a holding of 11,000.

**Trans World Airlines, Inc.** Disposal of 300 common shares by A. V. Leslie, officer and director, leaving a holding of 90; disposal of 490 common shares by Warren Lee Pierson, officer and director, leaving a holding of 1,500.

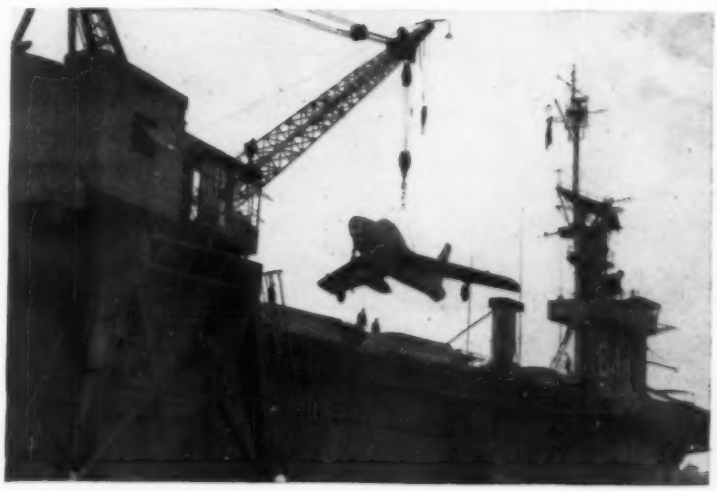
**United Aircraft Corp.** Disposal of 1,500 common shares by H. Manfield Horner, officer and director, leaving a holding of 10,500.

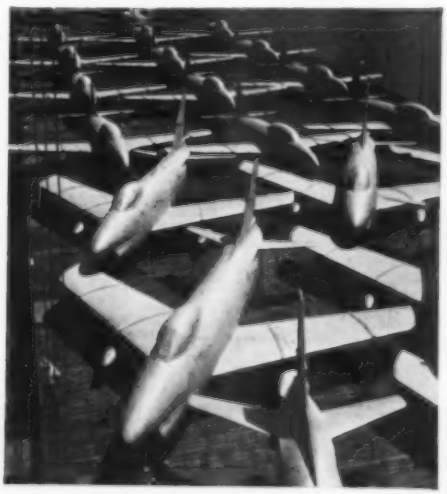
**Western Air Lines, Inc.** Disposal of 500 common shares by C. J. J. Cox, officer, leaving a holding of 1,250; disposal of 500 common shares by Stanley R. Shatto, officer and director, leaving a holding of 3,000.

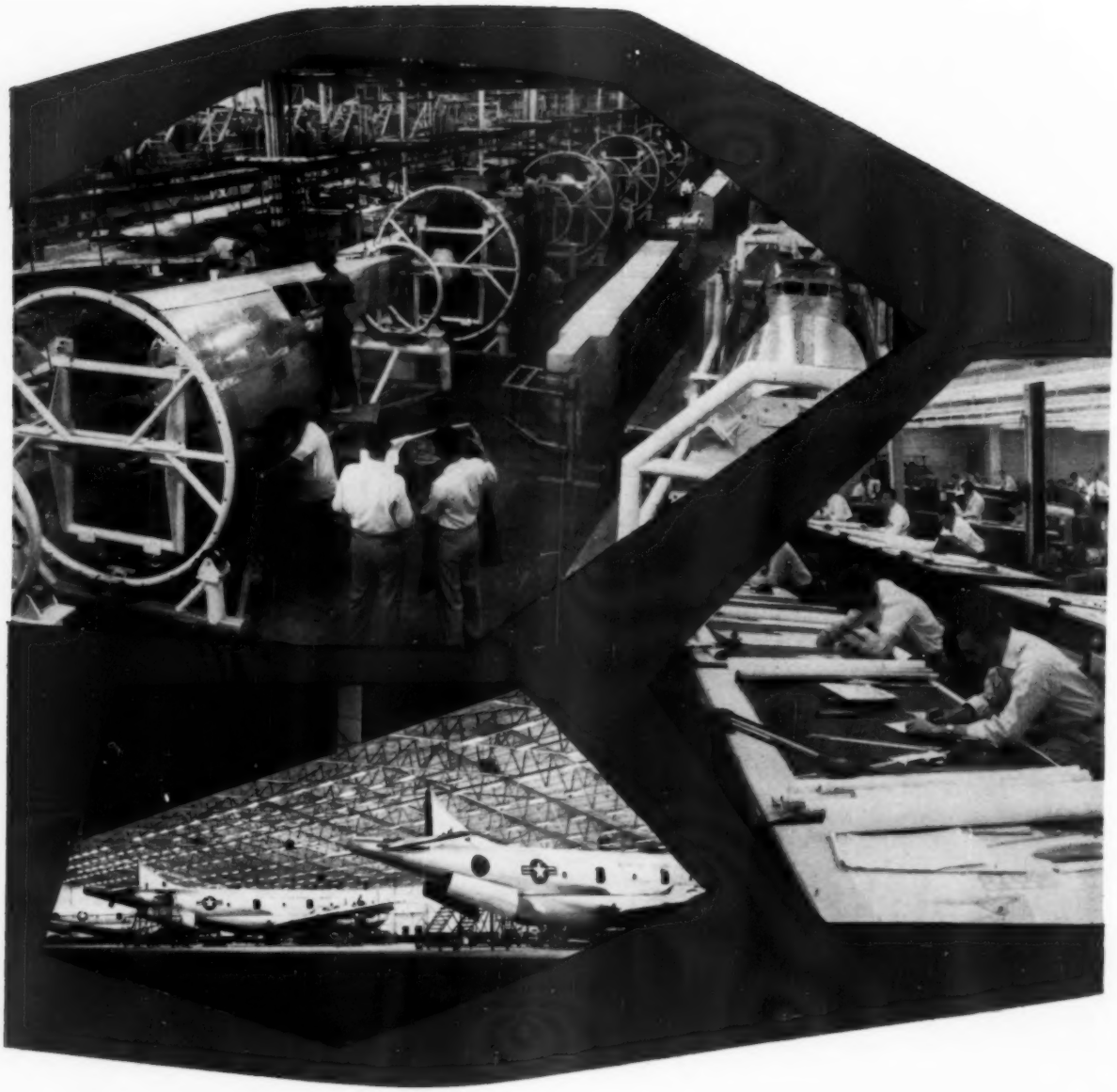
**Westinghouse Electric Corp.** Acquisition of 500 common shares by John M. Schiff, director, making a holding of 12,000.

# Navy Carriers Ferry USAF Planes Abroad

Keeping U. S. Air Force squadrons overseas supplied with new airplanes and replacements for flight-weary aircraft, the U. S. Navy's Military Sea Transportation Service and a few commercial freighters have ferried 1,173 fighters and trainers from Brookley AFB, Ala. since 1954. Major portion of the load has been borne by the Kaiser-built "Jeep" carriers U.S.S. Tripoli and Corregidor. Two Republic F-84F Thunderstreaks and a North American F-86D Sabre (photo, left) are readied at Brookley prior to loading aboard ship. Four F-86Ds, cocooned against salt-air corrosion, await shipment (above), while, below left, an F-84F is taken on board the Tripoli via a dockside crane. Cocooned F-86Ds, T-33As and T-6s are tied down on the Tripoli's flight deck (below, right).







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# USAF Contracts

Followin g is a list of unclassified contracts for $25,000 and over as released by Air Force Contracting Offices:

**DAYTON AIR FORCE DEPOT, Gentile AF Station, Ohio.**

**Raytheon Mfg. Co.,** Microwave & Power Tube Div., Waltham 54, Mass., tube, electron, transmitting magnetron type RK 6519/QK-254, 21 ea., (PR: 142791 & 638-553), $27,900.

**American Phenolic Corp.,** 1830 S. 54th Ave., Chicago 50, Ill., test bench group, bombing navigational system, type MC-1 in a/w exhibit WCL-825 dtd 10 Jan 55 and American Phenolic Corp., Dwg No. 181-110, engrg data, 89 ea., (RFP 33-604-56-1509), $1,974,099.

**Cook Electric Co.,** 2700 Southport Ave., Chicago, Ill., switch-pressure, contractor's part No. 555-3604, 1600 ea., handbook data, (PR 639183), $78,960.

**General Precision Laboratory, Inc.,** 63 Bedford Road, Pleasantville, N. Y., services and supplies to repair and overhaul components of 25 ea., AN/APN-82 systems with exception of AN/ASN-6 in a/w work spec appendix (A) dtd 18 Jan 55, appendix (B) and in a/2 appendix (C)(PR GE-476530, GE-476539-1), $75,000.

**Varian Associates,** 611 Hansen Way, Palo Alto, Calif., tube-electron pulsed amplifier, klystron, Type VA-87B in a/w RADC exhibit No. 2454 dtd 8 Aug 55, 525 ea., tube-electron pulsed amplifier Klystron, Type VA-87C, in a/w RADC Exhibit RADC 2454-1B dtd 8 Aug 55, 525 ea., PR 638520, not to exceed $3,997,066.

**Eitel-McCullough, Inc.,** San Bruno, Calif., tube-electron transmitting tetrode Jan Type No. 4 x 150A in a/w spec MIL-E-1B dtd 2 May 1952 and Amdt 3 dtd 12 Nov 53, 14000 ea., PR GE-638544, $282,660.

**Radio Corp. of America,** Tube Div., Harrison, N. J., tube-electron transmitting tetrode JAN Type No. 4 x 150A in a/w spec MIL-E-1B dtd 2 May 1952 and Amdt 3 dtd 12 Nov 53, 14000 ea., PR's 642747 and 638544, $282,660.

**Bone Engineering Corp.,** 701 W. Broadway, Glendale 4, Calif., dolly-engine test steel 7 ft. 5 in long, 4 ft 7 in. wide, 3 ft 7¼ in a/w Bone Engineering P/N 54542, 64 ea., RFP 33-604-56-1422, $92,764.

**Aircraft Products Co.,** Church Road and Crooked Lane, King Manor, Bridgeport, Pa., 1, test set-pilot static, type MB-1 in a/w specification MIL-T-8076A and Amend #2 dtd 18 Oct 1954, except that paragraphs 3.12, 4.2.1, 5.3, 6.3 are deleted, 212 ea., handbook data, 1 set, (RFP 33-604-56-1555), $58,242.

**General Electric Co.,** Lamp Div., 225 N. Wilkinson St., Dayton, Ohio, lamp, Par, 46 bulb, landing P/N AN-3129-4523, 18200 ea., PR:659346, $47,829.

**Bomac Laboratories, Inc.,** Salem Road, Beverly, Mass., electron tube-type 6322 transmitting gas switching TR in a/w MIL-E-1B dtd 2 May 52; Amend #3 dtd 12 Nov 53 and Suppl 1R dtd 13 Aug 54; and spec sheet MIL-E-1/370C, (SIGC) dtd 1 June 55, 7410 ea., RFP 33-604-56-1390, $92,625.

**General Electric Co.,** Hudson Falls, N. Y., network-pulse forming metal GE P/N 17F Appl AN/APS-42A redar set, 354 ea., (RFP 33 604-56-1417), $30,090.

**OFFICE OF SCIENTIFIC RESEARCH, ARDC, P. O. Box 1395, Baltimore, Md.**

**The University of Chicago,** Chicago 37, Ill., research, study and report, (AF18)-603-9), job, $100,000.

**Washington University,** St. Louis, Mo., research, basic research in mathematics, (AF18(600)-568), job, $31,155.

**Polytechnic Institute of Brooklyn,** 99 Livingston St., Brooklyn 2, N. Y., research, continuation of research and studies on space charge and photoconductivity in ZnS crystals, (AF18(600)-692), job, $35,350.

**California Institute of Technology,** Pasadena, Calif., research, instrumentation for the study of the physical properties of metals and alloys at elevated temperatures, (AF18(600)-1561), job, $49,000.

**University of Alabama,** University, Ala., research, study of the chemistry of niobium and its related elements, (AF18(600)-1567), job, $25,998.

**The University of Maryland,** College Park, Md., continuation of mathematical research in the fields of fluid dynamics and elasticity, (AF18(600)-573), job, $44,781.

**Duke University,** Durham, N. C., research, experimental studies of theory of chemical bonding, (AF 18(600)-1152), job, $70,830.

**Ringwood Chemical Corp.,** Ringwood, Ill., research, study of synthesis and properties pf ferrocenes and organic polymers containing aluminum and titanium, (AF 18(600)-1599), job, $38,500.

**Vitro Laboratories,** Div. of Vitro Corp. of America, 200 Pleasant Valley Way, West

## Voodoo in Baltimore

**Wing and landing gear subassembly manufactured for the McDonnell F-101 Voodoo nears completion at the Glenn L. Martin plant, Baltimore. Configuration of the very thin swept wing is unusual; note the mid-span ailerons and the fence at its mid-point. Inboard, the trailing edge of the flap assembly just shows; earlier evidence indicates these are blown flaps, using excess air from the twin Pratt & Whitney J57 turbojets to boost the lift coefficient for landings.**

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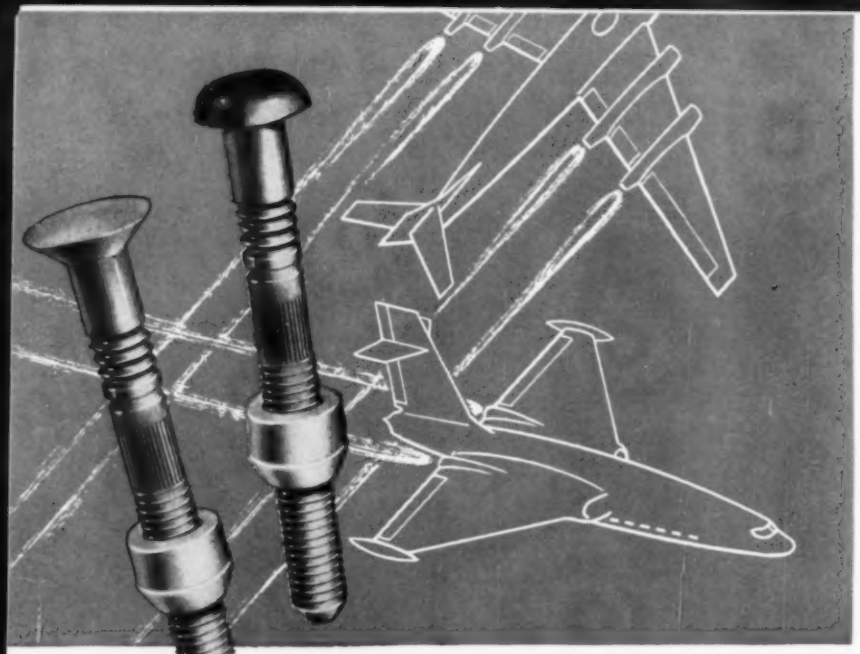

# Cherry Adds Aircraft Lockbolts to Fastener Line

Lockbolts for the aircraft industry have been added to the extensive line of aircraft fasteners produced by the Cherry Rivet Division of Townsend Company at its plant in Santa Ana, California.

Cherry Aircraft Lockbolts save weight, offer higher clinching action than rivets, more uniform clinch than bolts and nuts. Their use makes possible an effective seal and rigid joints with high shear and tension values. Fitting-up operations are simplified which helps increase production and results in a lower installed cost.

High production applications of the aircraft industry are especially adapted to the use of lockbolts since they combine the advantages of riveting and bolting —eliminate the disadvantages.

The Cherry Lockbolt line includes a complete range of diameters, grip lengths, and head styles which are designed and produced to meet specifications and requirements of the aircraft industry. They are available in alloy steel and aluminum alloy.

The addition of lockbolts to the Cherry line is further evidence of the continuing program at the Cherry Rivet Division which has as its objective the ultimate in fastening service to the aircraft industry. In fact, all the resources of the Santa Ana plant—experience—technical skill—special equipment—tremendous capacity —the facilities of its research and development department plus the services of its field engineers are devoted exclusively to providing better fastening methods for the aircraft industry.

For information on Cherry Lockbolts, write for new bulletin TCL-111 to Townsend Company, Cherry Rivet Division, P.O. Box 2157-N, Santa Ana, California.

**CHERRY RIVET DIVISION**

SANTA ANA, CALIFORNIA

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275 Erie Street, Lancaster, N. Y.
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15 West 57th Street, New York 19, N. Y.

Orange, N. J., research, reaction studies in the high temperature arc, (AF 18(603)-3), job, $171,430.

**Cornell University**, Ithaca, N. Y., research, mass spectrometric studies of vaporization processes at high temperatures, (AF 18(603)-1), job, $34,240.

**Regents of the University** of California, Berkeley, Calif., research, study of gaseous radiation, (AF 18(600)-1570), job, $33,180.

**New York University**, Washington Square, New York 3, N. Y., research on the stall flutter of a single airfoil, (AF 18(600)-1372), job, $390,000.

**Polytechnic Institute of Brooklyn**, 99 Livingston St., Brooklyn 22, N. Y., research, continuation of research on chemistry of photosensitization, (AF 18(600)-1182), job, $29,280.

**Trustees of Columbia University** in the City of New York, Box 6, Low Memorial Library, New York 27, N. Y., research, continuation and extension of research in control systems, (AF 18(600)-677), job, $41,275.

**California Institute of Technology**, Pasadena, Calif., research in the investigation of secondary flows in axial compressor stages, (AF 18(600)-178), job, $27,500.

**California Institute of Technology**, Pasadena, Calif., research in very-low-frequency radio propagation, (AF 18(600)-1552), $29,-185.

**Rand Corp.**, 1700 Main St., Santa Monica, Calif., research study and reports, (AF 18(600)-1600), $1,500,000.

**University of Rochester**, Rochester 3, N. Y., continuation of research on primary cosmic radiation and its interaction with matter, (AF 18(600)-380), job, $54,509.

**California Institute of Technology**, Pasadena, Calif., research, properties of air and propellant reactions at high temperatures and pressures, (AF 18(603)-2), job, $67,920.

**Propulsion Research Corp.**, 1860 Franklin St., Santa Monica, California, research, study of the military applications potential of closed cycle gas turbines, (AF 18(603)-27), job, $25,493.

**Stanford Research Institute**, Stanford, Calif., research in charge transfer spectra and photochemical production of hydrogen, (AF 18(603)-7, job, $27,013.

**Yale University**, New Haven, Conn., research, continuation of research for theoretical studies on electron nuclear interactions and related problems, (AF 18(600)-771), job, $48,903.

**The University of Texas**, Austin, Texas, research, skin friction effects at supersonic speeds, (AF 18(600)-589), job, $65,000.

**MIDDLETOWN AIR MATERIAL AREA, Oldmsted AFB, Middletown, Pa.**

**American Machine & Metals, Inc.**, United States Gauge Div., Clymer Ave., Sellersville, Pa., release assemblies, parachute, 12998 ea., PR (MA-598637) (MA-662629), $696,643.

**Burdett Oxygen Co.**, of Cleveland, Inc., 3300 Lakeside Ave., Cleveland 14, Ohio, oxygen, gas, breathing, (IFB PR MA-662007), 7,916,000 cu ft., $43,267.

**Dye Oxygen Co., Inc.**, 3332 W. McDowell Rd., Phoenix, Ariz., oxygen, gas, breathing, (IFB PR MA-662007), 7,376,000 cu ft., $60,086.

**Air Reduction Co.**, Air Pacific Div., 220 Bush St., Rm. 961 Mills Tower, San Francisco 4, Calif., oxygen, gas, breathing, (IFB PR MA-662007), 6,775,000 cu ft., $46,037.

**National Cylinder Gas Co.**, 840 North Michigan Ave., Chicago 19, Ill., oxygen, gas, breathing, (IFB PR MA-662007), 9,032,000 cu. ft., $61,351.

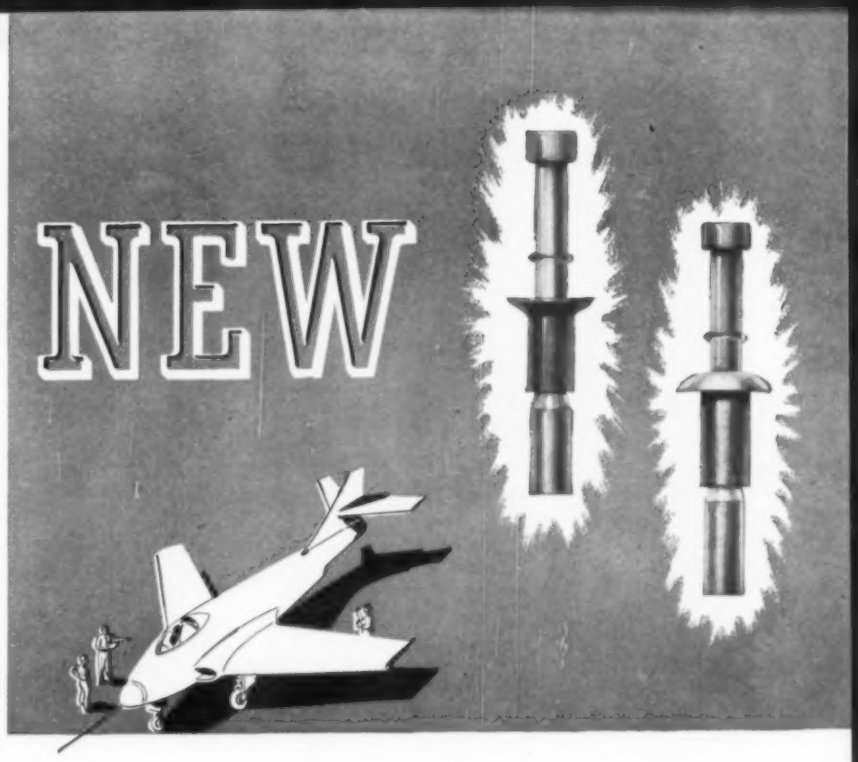
**Tex-Air Gas Co., Inc.**, 211-13 Buchanan St., P. O. Box 427, Amarillo, Tex., oxygen, gas, breathing, (IFB PR MA-662007), 3,321,000 cu ft., $31,677.

**Industrial Oxygen Corp.**, P. O. Box 557, 1837 Gladewater Road, Greggton, Tex., oxygen, gas, breathing, (IFB PR MA-662007), 2,366,000 cu ft., $26,101.

**Houston Oxygen Co., Inc.**, P. O. Box 1435, 3602 W. 11th St., Houston, Tex., oxygen, gas, breathing, (IFB PR MA-662007), 4,277,000 cu ft., $41,481.

**Balbach Co.**, 1201-07 California St., Omaha, Neb., oxygen, gas, breathing, (IFB PR MA-662007), 3,172,000 cu ft., $29,505.

**Whitmore Oxygen Co.**, 430 E. South Temple St., Salt Lake City, Utah, oxygen,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gas, breathing, (IFB PR MA-662007), 3,732,000 cu ft., $34,204.

**Air Reduction Co., Inc.,** Sales Company Div., 60 E. 42nd St., New York, N. Y., oxygen, gas, breathing, (IFB PR MA-662007), 3,285,000 cu ft., $214,173.

**Avco Mfg. Corp.,** Lycoming Div., 550 Main St., Stratford, Conn., unpacking, disassembly retrofit, test and repacking R-1820-82 engines and R-1820-86 engines, 60 ea., (MIPR R53-3366-197 Aer), $36,438.

**Decker Aviation Corp.,** 1361 Frankford Ave., Philadelphia 25, Pa., repair of indicators attitude, Gyro Type J-8, 1174 ea., $97,946, (RFP PR 718731).

**Curtiss-Wright Corporation,** Wright Aeronautical Div., Wood-Ridge, N. J., spare parts for R3350-89 engines, 25 ea., (PH (MA)205047), $87,887.

**Kindred Aviation Co.,** 3519 Pacific Ave., Burbank, Calif., piston, plate shaft, gear and cylinder, 8889 ea., (RFP PR 662677), $105,143.

**Pinseckl Helicopter Corp.,** Morton, Pa., Iran maintenance of H-25 aircraft, 15 ea., (PR (MA-598119) (MA-597545), $236,250.

**Minneapolis-Honeywell Regulator Co.,** Aeronautical Div., 2600 Ridgeway Rd., Minneapolis 13, Minn., repair and modification of components of the E-11, MA-4 and MB-1 automatic pilot systems, 599 ea., (PR (MA-598988), $133,071.

**Curtiss-Wright Corp.,** Wright Aeronautical Div., Wood-Ridge, N. J., overhaul and modification of YJ/J-65 series aircraft engines, 50 ea., (MIPR R56-4990-20-AER) (MIPR R56-4990-29-AER, Am #1), $340,-000.

**HEADQUARTERS AMC, Wright-Patterson AFB, Ohio.**

**Bell and Howell Co.,** 7100 North McCormick Road, Chicago, Ill., N-9 gun camera Aerno 74-2260, (PR 143023, 143023-1, 143024, 143024-1, 152722, 671415, 641705), $468,530.

**Bendix Aviation Corp.,** Eclipse-Pioneer Div., Teterboro, N. J., amplifier, in-flight-refueling, type MF-1 indicator, in-flight-refueling, type MA-9, (PR 635883 and 635804), $332,575.

**Kearfott Co., Inc.,** 1378 Main Ave., Clifton, N. J., loop assembly, AS-313B/ARN-6, (PR PE-158734, 158704, MIPR R-56-743-24 and MIPR R-55-152831), $369,696.

**Nasco, Inc.,** 6405 Northwest 36th Street, Miami, Fla., generators-30V, 200 amp, type P-1A, engineering and maintenance data, (PR SB-464606), $700,350.

**U. S. Gauge Div.,** American Machine and Metals, Inc., Sellersville, Pa., transmitter, oil pressure, type MS28005-3 Aerno 61-3102, (PR 635803), $88,090.

**Bendix Aviation Corp.,** Red Bank Div., Eatontown, N. J., generators, aircraft, D. C., 200 amp. 30 volt, (PR PE-63552), $803,686.

**Sperry Gyroscope Co.,** Div. Sperry-Rand Corp., Great Neck, L. I., N. Y., transmitters, type C-2, compensator, transmitter, indicator, type V-8, data, spare parts, special tools and test equipment, (PR MA-598756, PE-673505, MO-664830, MO-664834, OC-669386), $653,459.

**Kollsman Instrument Corp.,** Standard Coil Products Corp., 80-08 45th Ave., Elmhurst, N. Y., type C-2A true airspeed and mach-number computers, (PR 673519), $435,852.

**North American Philips,** 100 E. 42nd St., N. Y. 17, N. Y., tuning drive PD-5B/ARA-19, amplifier 203B/ARA-19, control panels 423B/ARA-19, (PR 168005, MIPR R-56-759-39-AER), $74,685.

**Leland Electric Co.** Div., American Machine and Foundry Co., 1501 Webster St., Dayton, Ohio, motor-generators, 250VA, 400 cycles, 1/3 phase, Aerno 42, 2316, (PR PE-635553 and SM-154573), $826,748.

**The Magnavox Co.,** 2131 Bueter Road, Fort Wayne, Ind., AN/ARN-6 radio compass-navigational receiver, (PR GE-561445, PE-158704, PE-158736, MIPR R-55-1528-31 AER, R56-74324AER, CG-35,847-B), $891,-054.

**The General Tire & Rubber Co.,** 1708 Englewood Ave., Akron, Ohio, wheel, nose, for F-100D aircraft, (PR PE-635787), $53,546.

**Federal Telephone and Radio Co.,** Div. of International Telephone & Telegraph Corp., 100 Kingland Road, Clifton, N. J., transformer rectifier, (PR 635561), $141,772.

**Barber-Colman Co.,** 229 Loomis St.,

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| SE-16-3 | MS25093/BuAer E5109-2 | 20 | 14.0 | 6 lbs. or $3,000 |
| SE-20-2 | MS25096/BuAer E54806-1 | 45 | 42.0 | 3 lbs. or $1,500 |
| MGE-22-1 | MS25095/BuAer E52805-1 | 35 | 33.0 | 2 lbs. or $1,000 |
| MGE-23-1 | MS25097/BuAer E54807-1 | 62 | 44.5 | 17.5 lbs. or $8,750 |
| MGE-31-1 | MS25162/AF Type MB-2 | 65 | 44.5 | 20.5 lbs. or $10,250 |

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# Resistoflex

Rockford, Ill., control boxes, (PR SA-545892), $39,154.

**Scintilla Div.**, Bendix Aviation Corp., Sidney, N. Y., relay and resistor box assembly, 61-1029, 347 ea., panel assembly, 61-1032, 347 ea., compartment assembly, 61-1031, 347 ea., breaker assembly, 61-1030, 694 ea., (PR MA59849), $114,482.

**Westinghouse Electric Corp.**, 32 North Main St., Dayton, Ohio, generators, 168 ea., regulators, 168 ea., panels, 168 ea., (PR SA672767), $336,616.

**Eclipse Pioneer Div.**, Bendix Aviation Corp., Teterboro, N. J., components of J-4 compass system, spare parts, special tools and test equipment, (RFP 673534), $2,375,-750.

**The Electric Auto-Lite Co.**, Toledo, Ohio, gauge, pressure, dial indicating, hydraulic 0-4000 PSI, 2 inch size type E-6, Aerno 61.2356, 5494 ea., (PR 673502 and 673502-1), $69,614.

**Kearfoot Co., Inc.**, 1150 McBride Ave., Little Falls, N. J., components of J-4 compass system, spare parts, special tools, test equipment, data, (RFP PE-673534), $2,504,-855.

**Sundstrand Machine Tool Co.**, Rockford, Ill., frequency and load controller, 91 ea., (PR 672751), $75,098.

**General Electric Co.**, X-Ray Department, 4855 Electric Avenue, Milwaukee, Wis., radar recording cameras, 0-20, spare parts, engineering data, handbook data, 68 ea., (PR 636286 and 427589), $149,600.

**U. S. Gauge Div.**, American Machine and Metals Inc., Sellersville, Pa., type MS 28018-1 manifold pressure gage, Aerno 61-231-2312, 1000 ea., (PR 598553), $46,800.

**Red Bank Div.**, Bendix Aviation Corp., Eatontown, N. J., motor generators, 874 ea., (PR PE-672754, SA-545934 and SA-611435), $631,358.

**Sylvania Electric Products, Inc.**, Electronics Systems, Div., 775 Great Arrow Ave., Buffalo 7, N. Y., spare parts of AN/ARC-49 radio sets for RCAF, (PR 180880), $57,772.

**The Goodyear Tire & Rubber Co., Inc.**, 1144 E. Market St., Akron 16, Ohio, increase in total contract price for aircraft brakes due to procuring of additional items, brake assembly for F-105A and RF-105A aircraft, (PR PE636125), $97,230.

**Jack & Heintz, Inc.**, Cleveland 1, Ohio, generators, engine driven, 30V, 300 amp., (Aerno 42-2010), (PR PE-672777, PE-672778, PE-635557, PE-6355580), $223,020.

**McCLELLAN AFB, McClellan, Calif.**

**Strato Div.**, Fairchild Engine & Airplane Corp., Bayshore, L. I., N. Y., fuel flow proportioners, F2P40-1, 72 ea., (RFP 18383); contract: NR AF 04(606)-4785), $152,160.

**Hughes Aircraft Co.**, Culver City, Calif., kit, control surface tie-in components of CSTI system in F86D A/C, 900 ea., spares for one year period, unit and quantity not applicable, spares not to exceed 30 percent of cost of item 1., (P/R 6667, contract Nr AF 04(606)-4812), $2,340,000.

**North American Aviation, Inc.**, Fresno, Calif., kit GP A components, for installation of advanced electronic system in F86D A/C, 900 ea., record type TO-1F86D-558, one per kit, unit and quantity not applicable, (P/R 6667, contract Nr AF 04(606)-4793), $6,423,555.

**North American Aviation, Inc.**, Fresno, Calif., kit, for installation of extended leading edges on F86D A/C, 900 each, record type TO-1F86D-558, one per kit, unit and quantity not applicable (P/R 6667, contract Nr AF 04(606)-4797), $1,569,422.

**Aircraft Radio Corp.**, Boonton, N. J., kit, for installation of $22 radio receiver unit, F86D A/C, 900 ea., spares, not to exceed 30 percent of cost of item 1, unit and quantity not applicable (P/R 6667, contract Nr AF 04(606)-4811), $393,447.

**AIR FORCE MISSILE TEST CENTER, Patrick AFB, Fla.**

**Reeves Instrument Corp.**, 215 E. 91st St., New York 28, N. Y., development and fabrication of a quantity of major spare components for AFMTC tracking radar model II (P.R. No. FP-1 (56)-290), job, $164,425.

**Talley Register Corp.**, 5300 14th Ave., N.W., Seattle 7, Wash., plotter, digital, high

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speed and component parts, lea. (P.R. No. FP-1 (56)-140), $25,419.

**Perkin-Elmer Corp.**, Norwalk, Conn., interim recording optical tracking instrument systems, (P.R. FP-1 (56)-281), job, $300,000.

**International Telemeter Corp.**, 2000 Stoner Ave., Los Angeles 25, Calif., high speed magnetic core memory, (PR No. FP-1 (56)-134), job, $267,863.

**WARNER ROBINS AMA, Robins AFB, Ga.**

**Sheridan-Punaro Co.**, Macon, Ga., construction of communication base receiver and transmitter buildings, (IFB-46 Local Purchase), $36,273.

**Acme Steel Co.**, Dexion Div., 2840 Archer Ave., Chicago 8, Ill., dexion slotted steel angles, (PR-23A-7036, Local Purchase), $47,981.

**Curtiss-Wright Corp.**, Caldwell, N. J., repair, overhaul, modification and packaging of turboelectric assemblies, (PR-734538), $26,230.

**Handley Brown Heater Co.**, Jackson, Mich., modification of S-2 and S-2A Bomb rack to the MA-4A configuration, approx. 6000 ea., (PR-734850-408180), $213,830.

**Aeroproducts Div.**, G.M.C., Dayton, Ohio, repair and modification of aircraft propeller assemblies, $63,900.

**Curtiss Wright Corp.**, Propeller Div., Caldwell, N. J., aircraft propeller spare parts, $135,045.

**Aero Equipment Corp.**, Bryan, Ohio, pneumatic drills, portable, Type 2, Class 1, Style A, Spec MIL-D-4127, 2968 ea., (IFB-56-308), $85,745.

**Peck, Stow & Wilcox Co.**, Southington, Conn., shearing machine, metal squaring, foot powered, 18 gage x 96 in. capacity, 36 ea., (RFP-56-1036), $37,260.

**D. C. Cooper Co.**, 1467 S. Michigan Ave., Chicago 5, Ill., degreaser, cleaning parts, agitating rack, 98 ea., (RFP-55-1422), $106,722.

**North American Aviation Inc.**, 12214 Lakewood Blvd., Downey, Calif., revisions to basic handbooks on field maintenance, overhaul and parts breakdown, (PR-584475), $286,241.

**SAN ANTONIO RESEARCH and DEVELOPMENT PROCUREMENT OFFICE, ARDC, Lackland AFB, San Antonio, Texas.**

**American Power Jet Co.**, 705 Grand Ave., Ridgefield, N. J., research and reports on human engineering analysis of Arctic effects on aircraft maintenance, (Contract AF 41 (657)-41), $34,682.

## Army Contracts

Following is a list of unclassified contracts for $25,000 and over as released by Army Contracting Offices:

**REDSTONE ARSENAL, Huntsville, Ala.**

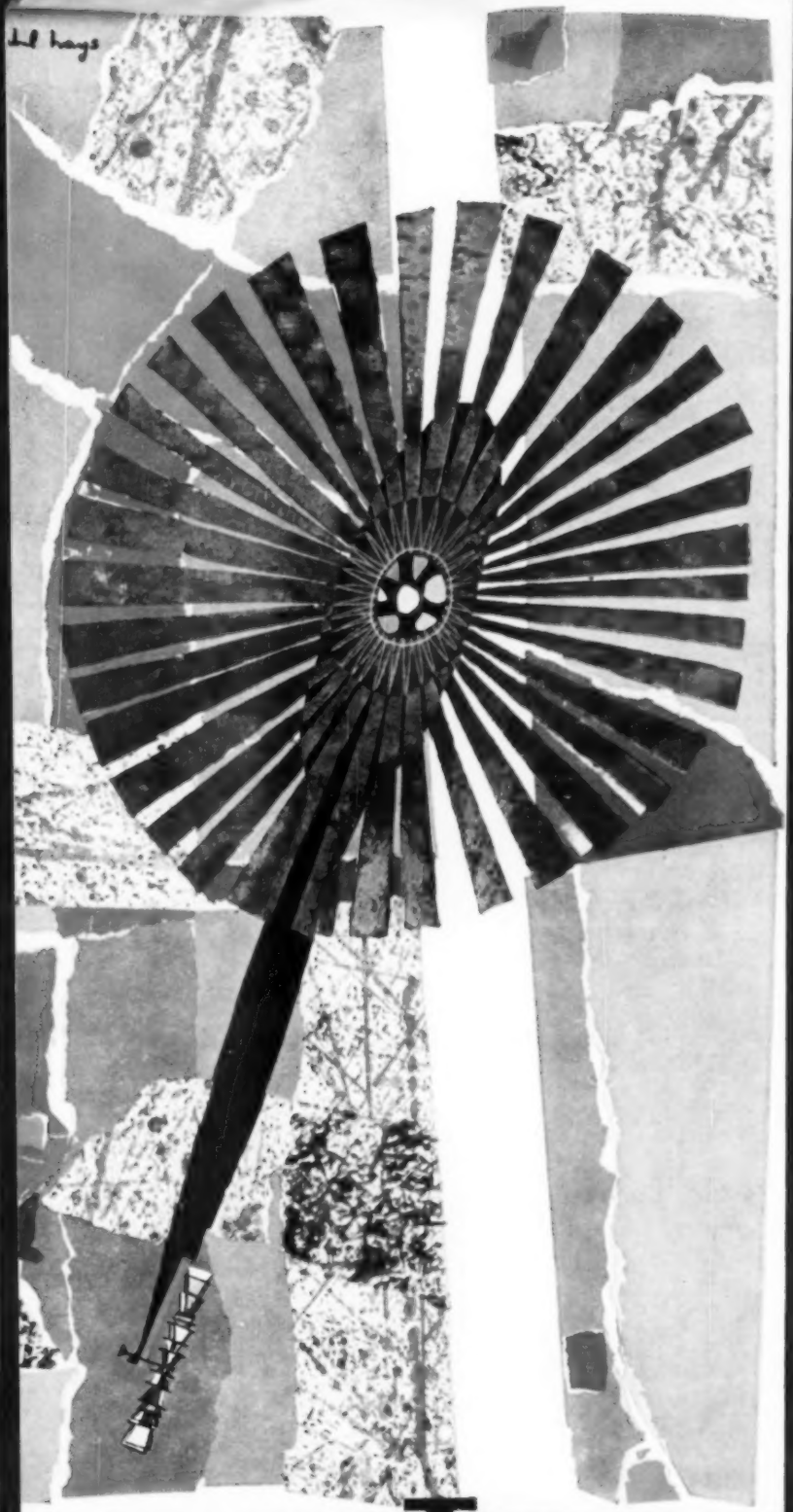
**Cook Research Labs**, Div. of Cook Electric Co., 2700 Southport Ave., Chicago 14, Ill., research, design, development and tests of missile components and delivery of one packaged unit, job, (Purchase Request No. CS 4890-56), $149,766 (Estimated).

**Fairchild Aerial Surveys, Inc.**, 224 E. Eleventh St., Los Angeles 15, Calif., engineering services for aerial photography and mapping of Redstone Arsenal reservation, job, (Purchase request No. CS-4508-56), $39,000.

**Cole Labs, Inc.**, 42-25 Ninth St., Long Island City 1, N. Y., fuel, rocket engine, SM2, per spec MPD-229 amendment 1, with exception that Furfuryl alcohol to be per spec MPD-123A, amendment 1 and except for the hydrazine which is to be furnished by the government in government owned 55 gal drums, 416880 lb, (Purchase request No. 1-56-ORDDW-IDP-S), $101,302.

**Benson Mfg. Co.**, 1811 Agnes, Kansas City, Mo., drums, aluminum, bilge type, 55 gal capacity, per spec, MPD-284, Ord corps dwg, 8026235, rev B, 967 ea., (Purchase Request No. 1-56-ORDDW-IDP-S), $61,888.

**Bodine-Bryson & Rolling, Inc.**, 719 S. 20th St., Birmingham, Ala, arrangement of movable partitions, job, (Purchase Request No. CS 244-56), $40,000, estimated.



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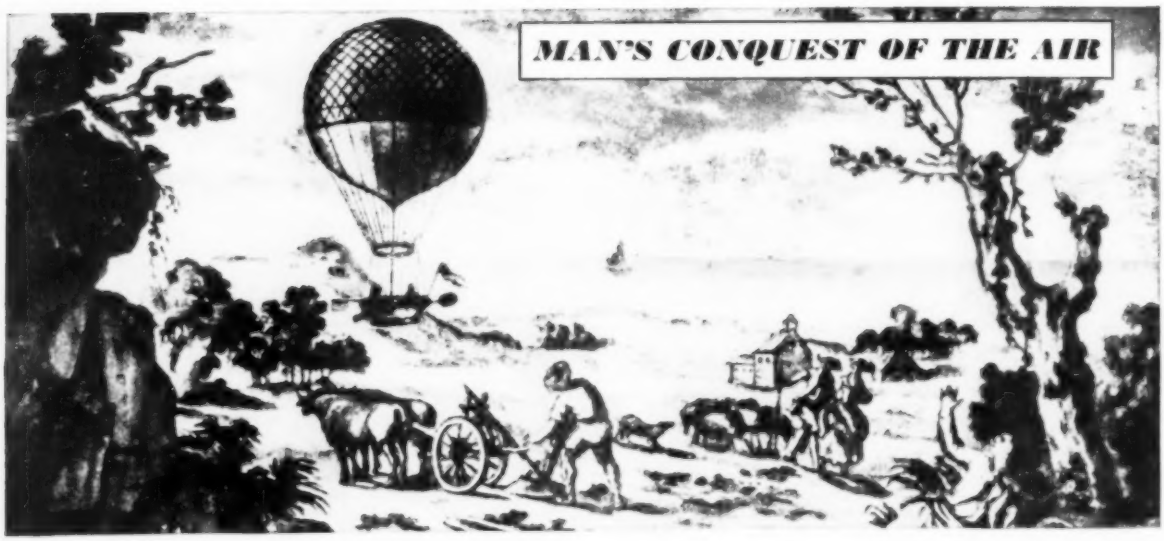


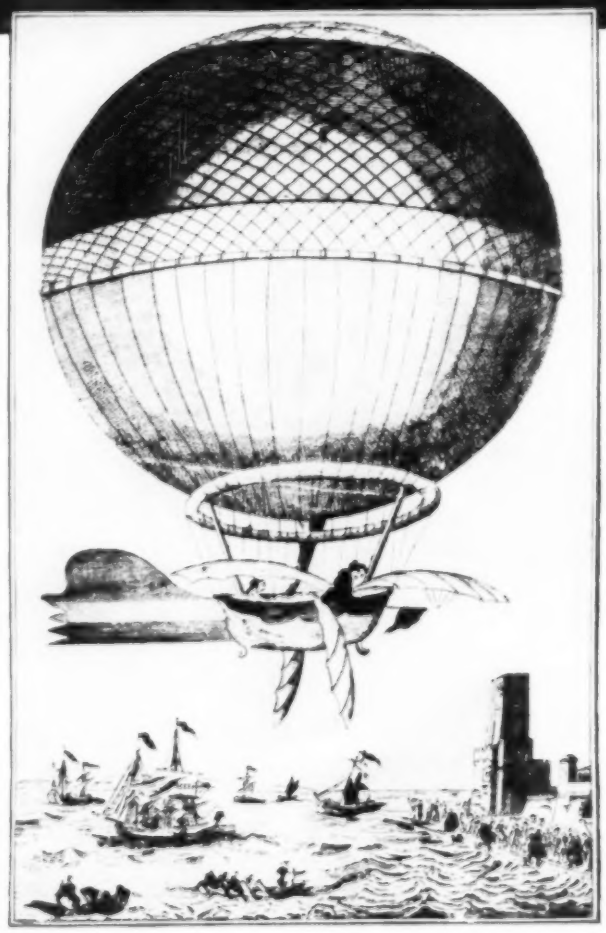

# *First Flight over the English Channel*

"The borderline of nations is crossed in the Air! . . . The seas are no longer barriers!" This was the exciting news on January 7, 1785, when Jean Pierre Blanchard, French aeronaut, and Dr. John Jeffries, American from Boston, made the daring and hazardous first air journey across the English Channel by balloon.

As the huge gas-filled sphere rose over the cliffs of Dover, sightseers crowded the coast, as well as boats off shore, to watch this first air venture over the sea. All went well until Blanchard and Jeffries were in sight of the French coast. With one quarter of the gas lost, they began to fall fast.

In short order they threw into the sea everything from sand ballast to apples and biscuits. "Still approaching the sea, we began to strip ourselves," Jeffries reported later. Not until even Blanchard's trousers went overboard did the balloon ascend. After two hours in the air Blanchard and Jeffries landed near Calais, where they received a royal ovation.

Less than two centuries later, aircraft span the globe. And ESSO research is part of that progress, helping to supply aircraft and engine builders, operators and pilots with the new and better aviation petroleum products they need.



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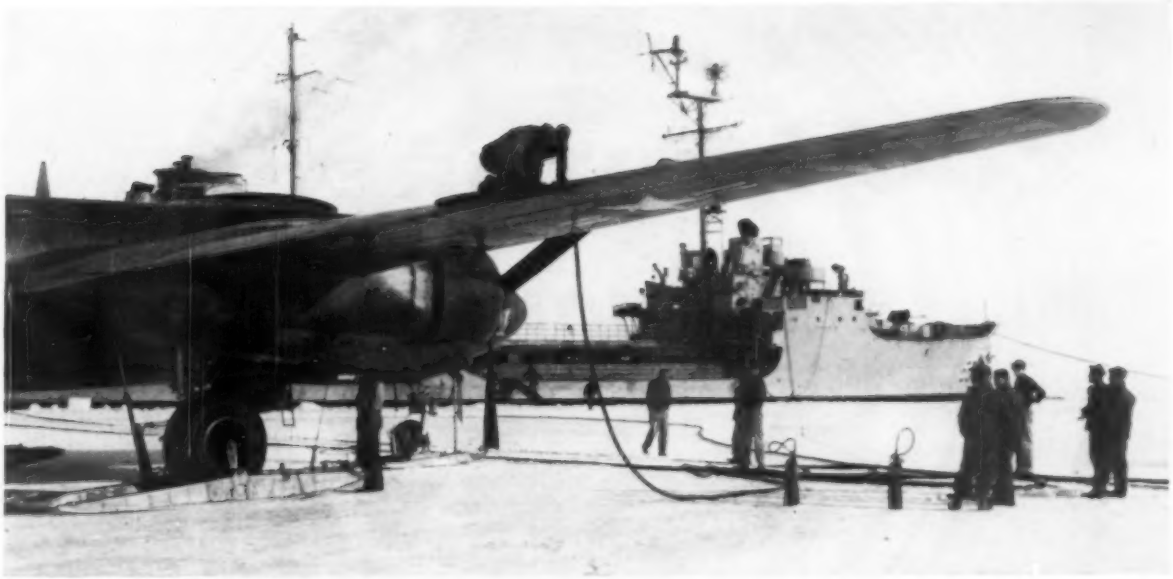

## U. S. Navy Explores the Antarctic

A Navy P2V Neptune patrol plane refuels on the ice from the nearby gasoline tanker U.S.S. Nespelen at McMurdo Sound during recent exploration of the Antarctic regions. Numerous avionics antennae are mounted atop the P2V's cabin, the retractable tricycle landing gear is fitted with skis. The Russians have also been active in Antarctic regions recently (AW Apr. 30, p. 33).

# Navy Contracts

Following is a list of unclassified contracts of $25,000 and over as released by Navy Contracting Offices:

**AVIATION SUPPLY OFFICE, 700 Robbins Ave., Philadelphia 11, Pa.**

**Aluminum Co. of America,** 1200 Ring Blvd., Washington, D. C., aluminum alloy, (IFB-383-579-56), various, $31,666.

**Reynolds Metals Co.,** 2500 S. Third St., Louisville 1, Ky., aluminum alloy, (IFB-383-579-56), various, $44,993.

**Mar Vista Engrg. Co.,** 5420 W. 104th St., Los Angeles, Calif., hyd. valve, (383/2150-61/55, 383/2150-197/54, 383/2150-563/53), 185 ea., $35,613.

**Cox & Stevens Electronic Scales,** 845 N. Colony Rd., Wallingford, Conn., A/C weighing scales, (383/29065-37S3/21/22/56), various, $82,989.

**Malabar Mfg. Co.,** 950 Doolittle Dr., San Leandro, Calif., airplane jack parts, (383/29065-54S3/24/56), various, $27,407.

**Clifford Mfg. Co.,** Standard-Thomson Corp., 152 Grove St., Waltham 54, Mass., heat exchanger (MIPR 33-600-3-02A-203 (18C), AS-269) various $62,930.

**Lear, Inc.,** 110 Ionia Ave., N.W., Grand Rapids 2, Mich., amplifier, (383/2120-614X6/3/52), 36 ea., $60,609.

**General Textile Mills Inc.,** 450 Seventh Ave., N. Y. 1, N. Y., flying helmet (383/29045 73G3/16/56), 1200 ea., $29,304.

**The Aerotherm Corp.,** c/o The Thermix Corp., Greenwich, Conn., seat asy (383/2110-1616/52, 383/2150-629/50), various, $26,648.

**AiResearch Mfg. Co.,** Sky Harbor Airport, 402 S. 36th St., Phoenix, Ariz., pump asy (383/2150-613/50), various, $34,868.

**Douglas Aircraft Co., Inc.,** 3000 Ocean Park Blvd., Santa Monica, Calif., brace asy (383/2110-2010A4/3/51), various $62,637.

**Eclipse-Pioneer Div.,** Bendix Aviation Corp., Teterboro, N. J., adapters, (383/2120-567/51, 383/2120-82/54, 383/2120-27/55), various, $81,056.

**Scintilla Div.,** Bendix Aviation Corp., Sherman Ave., Sidney, N. Y., distributor asy (383/2116-36/54), various, $60,802.

**AiResearch Mfg. Co. of Arizona,** Garrett Div., 402 S. 36th St., Phoenix, Ariz., servicing on government-owned equipment, (383/23055-12x2/1/56, 383/2150-603/50), various, $583,863.

**Bendix Products Div.,** Bendix Aviation Corp., 401 Bendix Dr., South Bend 21, Ind., fuel controls (383/2117-211/51), various, $251,049.

**Met-Pro, Inc.,** 5th & Mitchell Sts., Lansdale, Pa., engine overhaul stand, (383/2363-2S2/5/6/56), 164 ea., $120,728.

**Eclipse-Pioneer Div.,** Bendix Aviation Corp., Teterboro, N. J., air speed tester, (383/29067-33S3/4/56), 543 ea., $113,401.

**Vickers, Inc.,** 1400 Oakman Blvd., Detroit, Mich., Hyd. pumps, (383/2150-110/54, 383/2150-390/53), 32 ea., $26,135.

**Spraviat Corp.,** 1 Park Avenue, N. Y. 16, N. Y., compound, (383/29081/1884G4/5/56), 22280 gal., $130,383.

**Ameo Chemical Corp.,** 1400 Middle Harbor Road, Oakland 20, Calif., ethyl acetate, (IFB-383-572-56), various, $49,753.

**Mario Papa & Sons, Inc.,** 121 S. Main St., Gloversville, N. Y., leather flying gloves, (IFB-383-362-56), various, $143,727.

**General Electric Co.,** 1405 Locust St., Philadelphia, Pa., tachometer generator, (IFB-383-671-56), 2297 ea., $95,073.

**Commercial Chemical Co.,** Box 349, Fahway, N. J., paint, (IFB-383-424-56), 34000 gal, $75,426.

**American Machine & Metals Inc.,** United States Gauge Div., Sellersville, Pa., oil pressure indicator, (IFB-383-293-56), 426 ea., $44,636.

**William Armstrong Smith Co.,** 109 E. Forrest Ave., East Point, Ga., paint, (IFB-383-424-56), 11600 gal., $26,174.

**Rubber Products Corp.,** 3110 Oakridge Dr., Dayton 7, Ohio., "O" rings for maintenance of A/C (IFB-383-535-56), various, $44,506.

**Linear, Inc.,** State Rd., & Levick St., Philadelphia 35, Pa., "O" rings for maintenance of A/C (IFB-383-535-56), various, $51,014.

**Arrow Lacquer Corp.,** 208 Dupont St., Brooklyn 22, N. Y., lacquer (IFB-383-390-56), 14752 gal, $31,877.

**Grumman Aircraft Engineering Corp.,** Bethpage, Long Island, N. Y., magazine asys, (IFB-383-369-56), 46 ea., $30,804.

**Aluminum Co. of America,** 1200 Ring Building, Washington 6, D. C., aluminum alloy sheets, (IFB-383-223-56), various, $163,373.

**Weston Electrical Instrument Corp.,** c/o Joralemon Craig & Co., Philadelphia 4, Pa., temperature indicator, (IFB-383-360-56), 1465 ea., $41,093.

**American Phenolic Corp.,** 1830 S. 54th St., Chicago 50, Ill., cable, (IFB-383-197-56), 27000 ft., $51,200.

**Metalcraft Mfg. & Sales Corp.,** 111 E. 17th St., Kansas City, Mo., cable asy. set, (IFB-383-106-56), 1679 ea., $257,861.

**Lite Mfg. Co., Inc.,** 101 W. 21st St., New York 11, N. Y., tow aerial sleeve target, (IFB-383-254-56), various, $115,446.

**D. L. Auid Co.,** E. Fifth Ave., & N. Fifth St., Columbus, Ohio, aircraft mooring reels, (IFB-383-261-56), 80840 ea., $494,741.

**Surface Combustion Corp.,** 400 Dublin Ave., Columbus 16, Ohio, services, (383/23055-17x5/1/56), 165 ea., $68,145.

**Curtiss-Wright Corp.,** Wood-Ridge, N. Y., services, (PREN11-4645-56), various $176,-245.

**Airborne Accessories Corp.,** 1414 Chestnut Ave., Hillside 5, N. J., gear boxes, (383/2110-1601/52), 1274 ea., $34,449.

**Goodyear Tire & Rubber Co., Inc.,** 1144 E. Market St., Akron 16, Ohio, aircraft mooring wheel assys, (383/2110-1877/52), 285 ea., $34,394.

**Delgro Mfg. Co., Inc.,** Sussex, N. J., covers, life preserver vest, (155/123033/55), 22500 ea., $92,925.

**Breeze Corp., Inc.,** 700 Liberty Ave., Union, N. J., maintenance parts, (383/2116-34/54, 383/2116-142/53), various 045659.

**International Business Machines Corp.,** 7800 Ogontz Ave., Philadelphia 38, Pa., magnetic tape, (2888337/56), 1413 ea., $90,432.

**Sperry Gyroscope Co.,** Div. of Sperry Rand Corp., Great Neck, N. Y., indicators, (383/2120-482/52, 383/2120-72/54), various, $43,374.

**Union Electric & Mfg. Co.,** 1057 Summit Ave., Jersey City 7, N. J., test sets, (383/29069-75-E 2/6/56), 87 ea., $73,515.

**Electrical Engineering & Mfg. Corp.,** 4612 W. Jefferson Blvd., Los Angeles 16, Calif., electrical 36 ct. motor, (383/2140-1685-E4/3/51), various, $65,167.

**Hoover Electric Co.,** 2100 S. Stoner Ave., Los Angeles, Calif., actuators, (383/2110-163/54, 383/2110-27/55), various, $75,073.

**AiResearch Mfg.,** 9851-9951 Sepulveda Blvd., Los Angeles 45, Calif., technical publications, (PDEN11-5480/56), various, $41,-449.

**AiResearch Mfg. Co.,** 9851-9951 Sepulveda Blvd., Los Angeles 45, Calif., technical publication, (PREN11-5480/56(593-55), various, $105,742.

**U. S. Gypsum Co.,** 300 West Adams St.,

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Chicago 6, Ill., paint (IFB-383-583-56), 23500 gal, $43,271.

**General Electric Co.**, 1285 Boston Ave., Bridgeport 2, Conn., wire, (IFB-383-196-56), various, $67,119.

**Patten Co., Inc.**, 1803 10th Ave., Lake Worth, Fla., life raft, (IFB-383-489-56), 250 ea., $104,714.

**Purolator Products, Inc.**, 970 New Brunswick Ave., Rahway, N. J., filter elements, (IFB-383-382-56), various, $29,188.

**Reynolds Metal Co.**, 2500 S. Third St., Louisville 1, Ky., aluminum alloy (IFB-33-223-56), various, $38,350.

**General Electric Co.**, 1405 Locust St., Philadelphia 2, Pa., indicator, (IFB-383-571-56), 715 ea., $42,185.

**Gould National Batteries, Inc.**, 35 Neoga St., Depew, N. Y., batteries, (IFB-383-177-56), various, $442,052.

**Atlas Paint & Varnish Co.**, 32-50 Buffington Ave., Irvington 11, N. J., enamel, (MIPR (23-195), R56-5344-ENG Amend 1), 25316 gal., $53,037.

**Axelson Mfg. Co.**, P. O. Box 58335, Vernon Station, Los Angeles 58, Calif., strut assy., (383.2110-60-54, 383/2110-75-54), various, $512,990.

**Jack & Heintz Inc.**, 17600 Broadway, Cleveland 1, Ohio, maintenance parts, (383/2117-220/51), various, $45,883.

**Mine Safety Appliances Co.**, 201 N. Braddock Ave., Pittsburgh 8, Pa., facepiece for oxygen mask, (383/2150-1334G3/5/52), various, $59,220.

**Mine Safety Appliances Co.**, 201 N. Braddock Ave., Pittsburgh 8, Pa., oxygen mask, (383/2150-1321 G3/3.5/56), various, $211,-206.

**New York Air Brake Co.**, Watertown, N. Y., maintenance parts, (383/2150-1190/51), various, $42,419.

**Clifford Mfg. Co.**, 152 Grove St., Waltham 54, Mass., oil cooler, (383/2150-1271/ x 7/3/52), 83 ea., $28,884.

**Atlas Paint & Varnish Co.**, 32-50 Buffington Ave., Irvington 11, N. J., enamel, (IFB-383-589-56), 22290 gal. $33,595.

**The Lewis Engineering Co.**, 339 Church St., Naugatuck, Conn., temperature indicators (IFB-383-521-56), 780 ea., $25,828.

**Columbus Jack Corp.**, 2200 S. Third St., Columbus 7, Ohio, jury strut, (IFB-383-492-56), 585 ea., $44,361.

**General Electric Co.**, 1405 Locust St., Philadelphia 2, Pa., tachometer indicators, (IFB-383-539-56), 1080 ea., $93,528.

**Standard Pressed Steel Co.**, Jenkintown, Pa., work benches, (IFB-383-342-56), various, $61,073.

**Columbus Jack Corp.**, 2200 S. Third St., Columbus 7, Ohio, skin adapters, (IFB-383-417-56), various, $59,760.

**Circo Equipment Co.**, 51 Terminal Ave., Clark (Rahway), N. J., degreasers, (IFB-383-317-56), various, $41,851.

**General Electric Co.**, 1405 Locust St., Philadelphia, Pa., tachometer indicators, (IFB-383-337-56), various, $52,536.

**Hydro-Aire Inc.**, 3000 Winona Ave., Burbank, Calif., hyd. valve assy, (383/2150-1555 X4/3/51), 340 ea., $41,653.

**The New York Air Brake Co.**, Watertown, N. Y., hyd. pumps, (383/2150-160/54, 383/2150-49/55), 24 ea., $27,240.

**Friden Calculating Machine Co., Inc.**, San Leandro, Calif., driftmeter sights, (383/29041-28x6/1/56), 47 ea., $139,825.

**Hydro-Aire, Inc.**, Burbank, Calif., fuel valves, (383/2150-68/55, 383/2150-588/53, 383/2150-1186/52), 265 ea., $78,919.

**BUREAU OF AERONAUTICS**, Washington 25, D. C.

**RCA Service Co., Inc.**, Camden 2, N. J., furnish field engineering services to provide technical assistance, instruction and training to naval field maintenance personnel in connection with the maintenance, repair and operation of aircraft electric and electronic equipment, NOas 56-114-s(MA-35-4420-56), 492 man-months, $473,320.

**Kollsman Instrument Corp.**, 8008 45th Ave., Elmhurst 73, N. Y., periscopic sextants, spare parts and mounts, NOas 56-196-f(PD-42-3021-55), 745, $1,102,792.

**Sperry Rand Corp.**, Sperry Gyroscope Co., Div., Great Neck, L. I., N. Y., compensators and flux valves, NOas 56-322-f (PD-42-1251-56), 399, $37,386.

**Texas Instruments Inc.**, 6000 Lemmon


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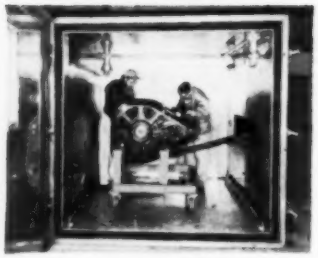

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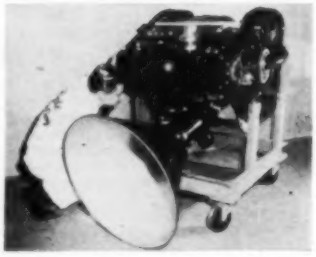

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Ave., Dallas 9, Tex., APA-91 indicator groups, 24, APS-38A radar sets less gyro, 57, NOas 56-349-f (PD-36-770-56), $1,091,737.

**United Aircraft Corp.**, (Pratt & Whitney Div., East Hartford 8, Conn. On a job order basis, perform work necessary to disconnect, remove, pack, crate and preserve the machine tools and capital equipment of the contractor as specified by the cognizant Naval Inspector, NOas 56-375-c (IP-12 6024-56), $250,000.

**Aerosonic Instrument Corp.**, 528 Reading Road, Cincinnati 2, Ohio, altimeters, pressure, MS28044-1, NOas 56-413-f (PD-42-1277-56), 2428, $167,508.

**Film Graphics Inc.**, N. Y. 19, N. Y., preparation of master shooting script and production of one(e) 16 mm kodachrome, sound, animated motion picture to be entitled "Your Career in the Navy", NOas 56-447-f (PH-5-2490-56), 720 ft (Approx), $31,294.

**Massachusetts Institute of Technology**, Div. of Industrial Cooperation, Cambridge 39, Mass., conduct a study of nickel-base alloys hardened with titanium and aluminum and their modifications, report, NOas 56-110-d (AE-41-1830-56), $25,000.

**The Emerson Electric Mfg. Co.**, 8100 Florissant Ave., St. Louis 21, Mo., services of (2) factory-trained field service technicans to instruct naval and marine corps personnel in the field in the operation, maintenance and servicing of Aero 9 and 11 series turrets and that portion of the Aero 21B turret system manufactured by the contractor, NOas 56-178-s (MA-33-4427-56), $31,299.

**Greer Hydraulics Inc.**, New York International Airport, Jamaica 30, N. Y., services of one (1) engineer to provide periodic inspection of test equipment, NOas 56-324-s (MA-45-4554-56), $25,000.

**Bendix Aviation Corp.**, Eclipse Pioneer Div., Teterboro, N. J., transmitters, rate of flow, type J-6A, NOas 56-373-F (PD-42-1220-56), 1295, $363,738.

**Telephonics Corp.**, Park Ave., Huntington, L. I., N. Y., ART-28 transmitters and power supply, NOas 56-403-F(PD-31-737-56), 153 ea., $196,569.

**Northwestern Universitiey**, Aerial Measurements Lab., 2422 Oakton St., Evanston, Ill., analog studies, assessment of armament control system, development of techniques and devices, modernization or procurement and installation of devices for use on the Navy-owned analog computer, reports, NOas 56-418-d (AR-23-4084-56), $286,614.

**Merriman Bros., Inc.**, 185 Amory St., Boston 30, Mass., stanchion assembly, in accordance with NAF drawings 22-60266, 22-60265-1 and military specifications, NAF part No. 22-60266-1, 5 ea., $35,780; pattern equipment for use in manufacture of guard, NAF Pt. No. 22-30995-1R, 1 set, $62; pattern equipment used in manufacture of guard NAF Pt. No. 22-31426-1, 1 set, N156-32799(156/250256/56), $56.

**Sylvania Electric Products, Inc.**, Bayside, N. Y., research and development in connection with vacuum tubes for fuses, NOrd-16724, $550,000.

## Lockheed Subcontracts 40 Per Cent of F-104A

Lockheed F-104A subcontracts, representing about 40% of the Starfighter manufacturing effort, have been awarded to: Beech Aircraft Corp., aft fuselage; Goodyear Aircraft Corp., nose section; Rheem Manufacturing Co., entire tail assembly and Temco Aircraft Corp., complete wing. Lockheed will build F-104A mid-fuselage and forward fuselage assemblies in Burbank and Palmdale with final assembly and flight test at Palmdale. First deliveries from F-104A subcontractors are scheduled late this year.

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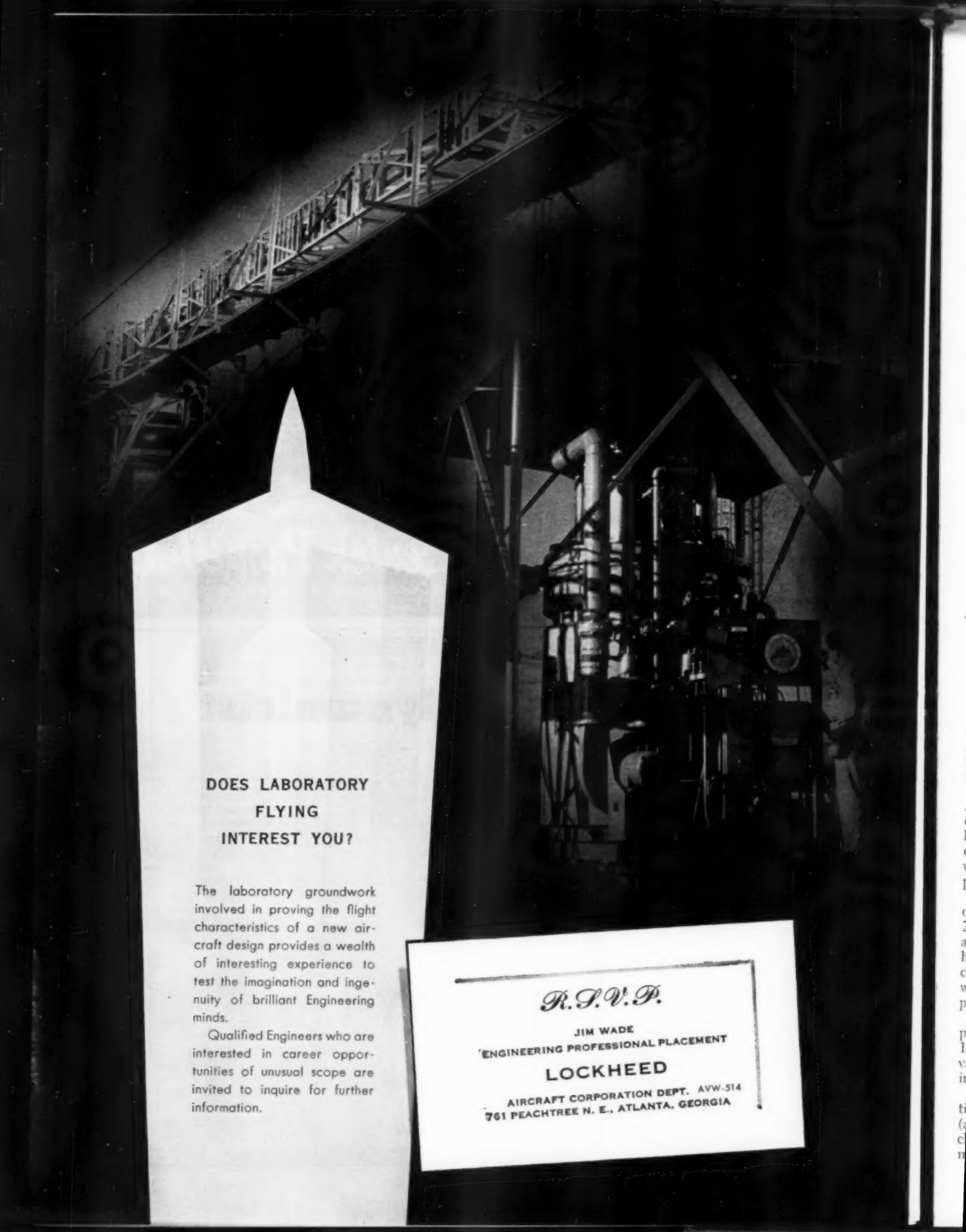

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## Military Takes Over Argentine Airline

**Buenos Aires**—The Argentine government has placed the state-controlled international airline, Aerolineas Argentinas, under the jurisdiction of the Aviation Ministry. It had ben run by the Ministry of Transport since 1948.

The Minister of Aeronautics, Air Commodore Julio Cesar Krause, in a press conference denied that the government will militarize the airline.

"This measure has been taken," he said, "to end a state monopoly which has greatly impeded the development of air transport in the country." He added that the move was also intended to curb monopolization of the airlines by private capital, presumably foreign airlines.

Air Commodore Krause said that military personnel may be called upon to "cooperate" in running Aerolineas Argentinas, but that only civilian pilots will fly planes outside Argentina. All existing international agreements and commitments will be respected, he added.

The airline now is entering a 45-day period under a civilian administrator presumably for reviewing the airline's operations and books. During this interval, Krause said, no vital decisions as to the fate of the airline will be taken. Owing to the country's financial situation, he added, plans concerning the airline's planes and equipment will be held in abeyance until some future time.

Handing over the airline to the Air Ministry is viewed here as final rejection of the recommendation of Dr. Raul C. Prebisch, economic advisor to the Argentine government, who advised that the line be sold to private capital.

By the end of the Peron regime, Aerolineas Argentinas had piled up a deficit estimated at well over 500 million pesos (about $27.8 million at the official 18:1 exchange rate). The line was losing money at the rate of $128 per flying hour in 1955.

Operating statistics show that planes of this line flew an average of 3 hours 23 minutes a day during 1951-53, as against an economical average of 10 hours per day. In 1955 and 1956, according to unofficial figures, the average went down below three hours per day per plane.

Aerolineas began in 1946 with 44 planes and now has 39 planes including 17 DC-3s, 5 DC-4s, 6 DC-6s, 4 Convair 240s and 7 Short Sandringham flying boats.

Net worth is estimated by the aviation minister at 1,000 million pesos, (about $55.6 million at the official exchange rate or $25 million at the free market rate).

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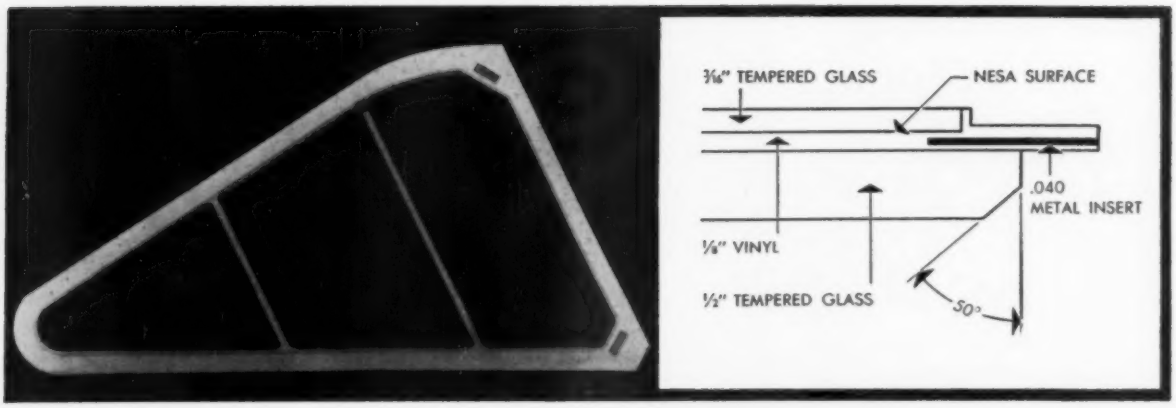


# How anti-icing "NESA"® windshields are used in the Convair F-102A

*A report from*

**THE PITTSBURGH AIRCRAFT GLAZING FILE**

The Convair F-102A all-weather supersonic jet interceptor has been assigned the job of stopping enemy bombers *before* they reach U.S. targets. It's the world's first delta-wing aircraft, and is capable of exceedingly high operational altitudes.

PPG electrically-heated NESA windshields with metal insert Flexseal® edges, give the F-102A improved visibility and safety. The windshield consists of 3/16" and 1/2" thick plies of tempered polished plate glass with a 1/8" vinyl filler. Electrical current, carried by the NESA coating of the inboard surface of the outboard glass, prevents ice formation and gives freedom from frost and fogging.

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**CONVERTED DOUGLAS B-26B** six-passenger transport carries Humphrey Gold Corp. executives cross-country at 320 mph.

# On Mark Rebuilds B-26s

**Glendale, Calif.**—Humphrey Gold Corp., miner of titanium deposits in Florida, recently took delivery of a 320-mph. Douglas B-26B six-passenger executive transport modified by On Mark Engineering Co. It was the ninth B-26 modified by On Mark, which specializes in this model for business transportation. Also in its shops are B-26s for Diamond Match Co., Colorado Oil & Gas Co., H. K. Porter Co., and Colorado Interstate Gas Co.

The conversion includes a completely new dual-control cockpit, dual-pane windows to reduce noise levels, a hydraulically operated air-stair door, automatic temperature control system and a large luggage area.

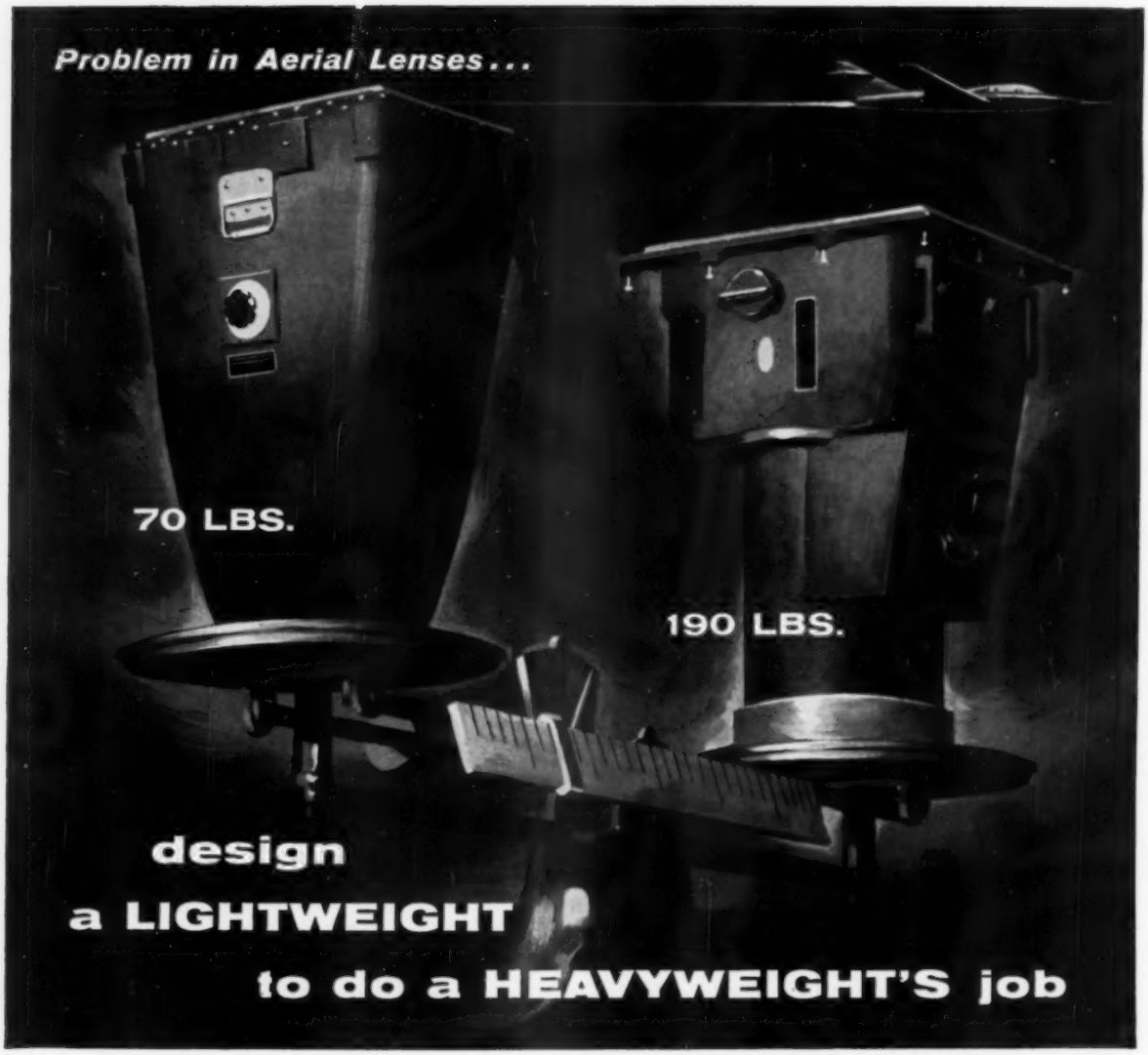
The Humphrey B-26 is powered by two P&W R2800-75 engines delivering 2,000 hp. each on takeoff, fitted with Hamilton Standard propellers with 23E50-505 hubs and 6359-18 blades. The airplane's maximum allowable gross takeoff weight is 35,000 lb.; payload is about 12,200 lb. Equipment includes a Collins integrated flight system and Sperry A-12 autopilot with approach coupler. A Janitrol S-50 50,000-Btu. heater is installed in the cabin and has a ground blower. A Model S-100 100,000-Btu. heater is in the nose section. Either heater can service both cabin and cockpit.

Normal range is 2,000 mi. Diamond Match Co.'s B-26 will have auxiliary external wingtip fuel tanks providing a total of 1,665 gal. Tip tanks will have individual pumps, capacitance system and dump valve.

**SOUNDPROOFED CABIN** has TV screen and instrument panel. Seats are facing backward.

**HYDRAULICS AREA** behind the cockpit has a jump seat (right). Double-pane windows help keep noise to comfortable level.

**DUAL CONTROL COCKPIT** shows extensive modification. Panels are non-reflecting black. Autopilot is mounted between seats.




As part of its never-ending war on weight the Air Force handed Perkin-Elmer this problem: find a way to trim the fat off bulky aerial telephoto lenses – without impairing their optical performance.

Drawing on the experience of a staff that has designed and built some of the world's most complex optical and electro-mechanical equipment, P-E came up with a definitive report on lightweight lens techniques. Using these new techniques, P-E took a large lens system weighing 190 pounds, remanufactured it down to a cool 70 pounds – with no loss in optical performance!

Even more dramatic weight reductions are in the offing. P-E has recently developed a method for mass-producing aspheric lenses. This new method will make possible lens systems with greatly simplified optical elements. Here again, the answer was found by a P-E staff whose experience went far beyond mere specialization.

Other projects that testify to Perkin-Elmer's ability to take a systems problem and "see it whole":

- ROTI Mark I (Recording Optical Tracking Instrument) for tracking the flight of guided missiles.
- Airborne infrared detection systems for military use.
- The Y-4 bombing periscope for the B-47.
- Prototype optical and radar bombing and navigation system now designated MA-2 for use on the B-52.
- Most of the large aerial photographic lenses in use today by the Air Force.
- Reactor periscopes for the Nautilus and Seawolf submarines.

In planning your next project, invite Perkin-Elmer to sit in. Our staff and unique facilities can bring your project to fulfillment sooner than you may now realize.

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In planning your career also – consider Perkin-Elmer. We have openings for physicists, electronic engineers and many others. We can offer top opportunities for advancement in a rapidly growing organization, located where comfortable suburban living is a reality.

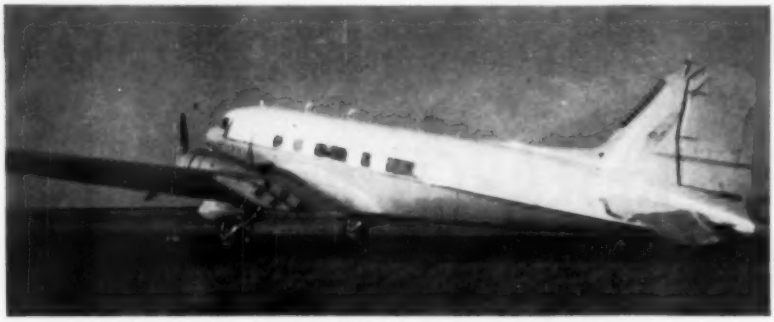
## Utility Plane Exports Increase Over 36%

An increase of more than 36% has been recorded in exports of U.S. business and utility planes weighing 6,000 lb. or less during March compared with the monthly average last year. Five companies delivered 72 planes valued at $784,287 to 19 foreign countries, bringing U.S. lightplane exports for the first quarter to 215 aircraft valued at $2,283,211. Last year's monthly average was 53 planes valued at $624,460.

The companies represented were: Aero Design & Engineering, Beech, Cessna, Piper and Taylorcraft. Shipments (in parentheses) by country: Argentina (2), Cambodia (1), Canada (14), Chile (6), Colombia (2), Costa Rica (1), Egypt (1), El Salvador (1), France (2), French Equatorial Africa (2), Holland (1), Iraq (4), Mexico (15), New Zealand (7), Nicaragua (2), South Africa (1), Spain (4), Union of South Africa (3), Venezuela (3). Eight planes were sent to Alaska and 1 to Puerto Rico.

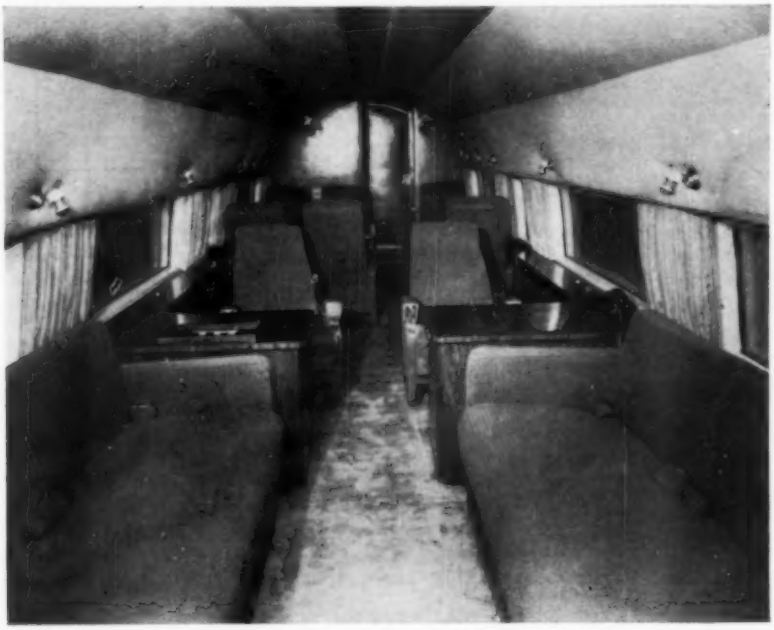
## Lightplane Imports Sought by Argentina

**Buenos Aires**—Argentina's Civil Aviation Administration is in the market for $1 million worth of light aircraft for pilot training, agricultural duties and public services such as emergency medical aid and disaster assistance. Government plans to encourage the development of these activities were announced



### Executive DC-3 Cruises at 218 Mph.

**A cruise speed of 218 mph. at 10,000 ft. using 700-hp. from each of this executive DC-3's P&W R1830-75 engines was accomplished mainly by installing Pan American Airways-type main landing gear doors, Miner's anti-drag ring cowlings and a Douglas retractable tail wheel. Cabin (below) seats 14. Plane, for Union Chemical & Materials, Inc., Chicago, Ill. was converted by Executive Aircraft Service, Inc., Dallas, Tex.**




New! Write for Catalog K-1

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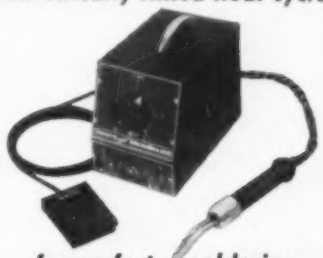

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*Director of Engineering*

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AIRCRAFT DIVISION
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# NEW AIR RESEARCH and DEVELOPMENT COMMAND edition

**Timed to include the details, plans and policy of the forthcoming Research & Development program as determined by the 1957 Airpower budget which is now undergoing debate and will become effective July 1, 1956.**

Manufacturers and suppliers having a business interest in Research & Development are guaranteed the largest and most significant audience *in this field* through Aviation Week's August 6, ARDC issue. Presenting exclusively the story of this major command, the ARDC issue will include a detailed budget analysis as referred to above with special reports on research in Missile Engineering, Astronautics, Avionics, Super Aerodynamics and Human Factors.

These reports are now being prepared through, on-the-spot writing, by AVIATION WEEK's technical staff (largest and most experienced of any aviation publication) in the 12 research, development and testing centers of the Air Research and Development Command of the United States Air Force.

**EXCERPT FROM HEADQUARTERS ARDC LETTER TO AVIATION WEEK.**

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*AVIATION WEEK average net paid ABC circulation June-December, 1955; 54,548. Paid circulation of current issues; 58,044. Recent readership research by Advertising Research Foundation shows 1.4 readers for every subscriber copy of AVIATION WEEK (readership determined by personal interview using strict recognition test). Current print order 61,898 copies.

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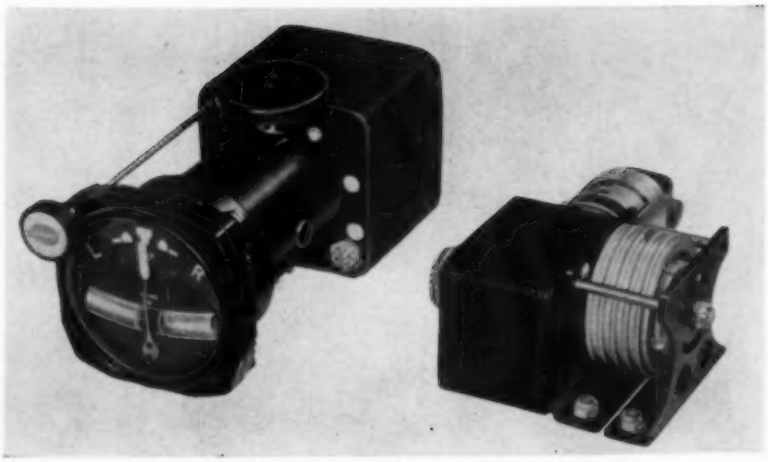

## Single-Axis Autopilot Cost $495

A new heading control for light business and personal planes is the three-pound Dart 1, priced at $495, which comes in kit form. It consists of two units, a turn sensing device (gyroscope of a standard turn-and-bank indicator) and an actuator, connected by a cable. Its ability to maintain directional stability prevents the often-fatal "graveyard spiral." Unit is made and distributed by Air Associates, Inc., Teterboro, N. J.

by Brig. Gen. Carlos Garcia Cuerva, national director of civil aviation.

Immediate work on the building up of the country's fleet of small aircraft includes:

• **Obtaining dollar exchange** from the Central Bank for import of planes and parts at the official rate of 18:1 (normal importing is handled on a free-market rate of approximately 36:1). The National Bank is being asked to develop a special credit system for financing plane purchases.

• **Flying clubs** and other private plan users are submitting data concernin the type of planes they want.

The government plans to pay direct subsidies to flying clubs to encourage pilot training, replacing the present system of payment calculated on hours of flying time. The National Civil Aviation School will be reinstated this year.

## Piper Tests Twin-Engine Tri-Pacer

Feasibility of compounding powerplants to give single engine-aircraft twin-engine reliability is being evaluated by Piper Aircraft Corp. on this Tri-Pacer testbed having two 90-hp. Continentals turning individual props. Piper emphasizes that the project has no immediate applications; it may be used on some future lightplane.

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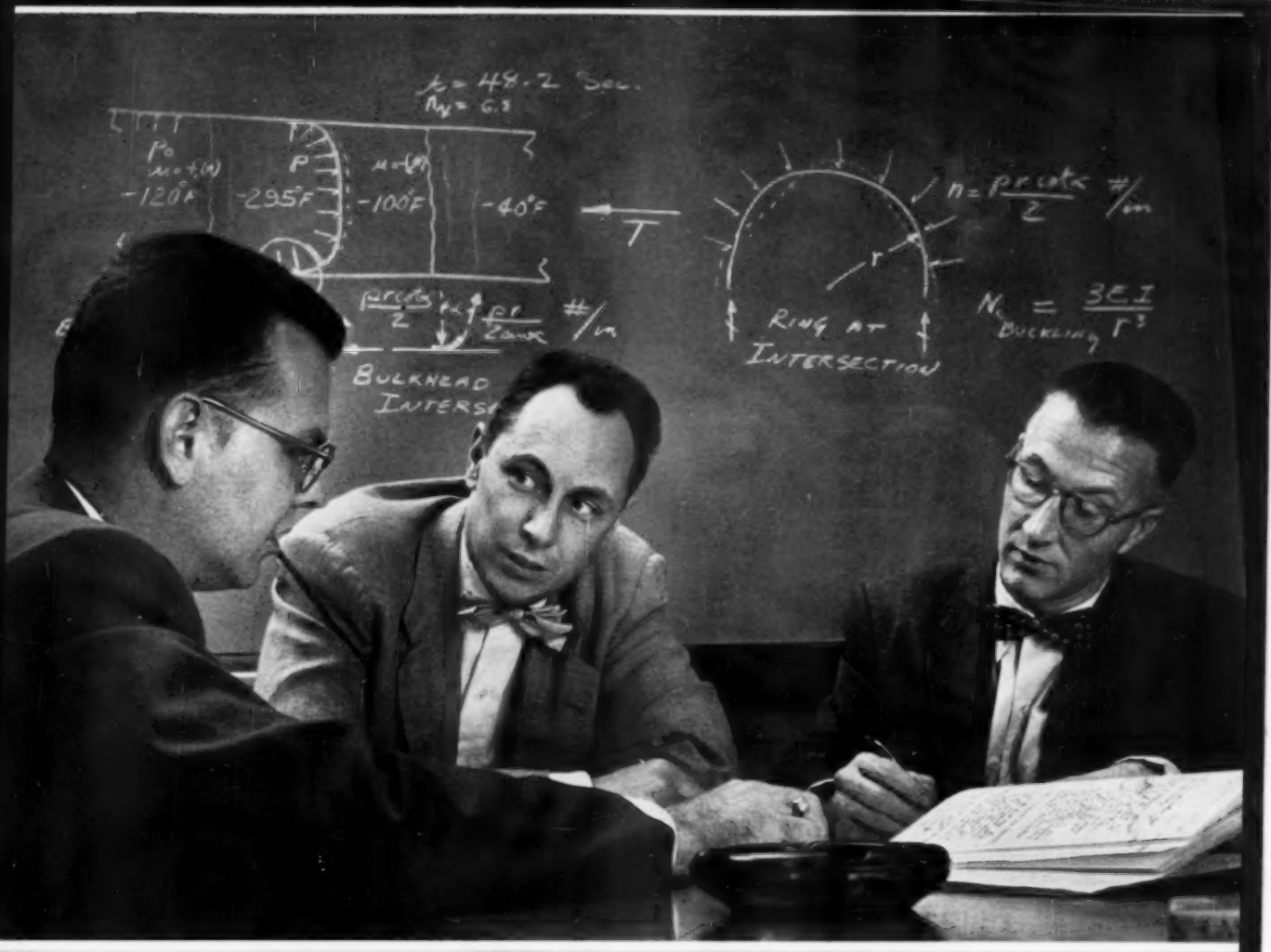


J. E. Jean (left) Stress Group Engineer, L. A. Riedinger (center) Design Specialist, and J. A. Johnson, head of the Structures Engineering Department, discuss structural effects of high thermal gradients in thin wall pressure vessels.

# TRANSIENT THERMAL STRESS IN MISSILE SYSTEMS

The ever increasing performance requirements of guided missiles are paralleled by structures problems that grow constantly in complexity. Of these, transient thermal stress is one of the most urgent in light of projected new developments.

Several approaches offer solutions to this problem. Both new design concepts and advanced methods of analysis, utilizing the most modern computers, present favorable avenues of solving structures problems such as transient thermal stress.

Other areas of interest include:

- Thermal buckling and stress investigation.
- Structural optimization in time-temperature environment.
- Structural dynamics including acoustic vibration, flutter, vibration isolation and dynamics of elastic bodies.
- Evaluation of materials for high temperature strength and short time creep properties.

Those possessing a high order of ability and interest in these fields are invited to write. Please address inquiries to the Research and Engineering Staff at Van Nuys.

*Lockheed* MISSILE SYSTEMS DIVISION

LOCKHEED AIRCRAFT CORPORATION

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## PRIVATE LINES

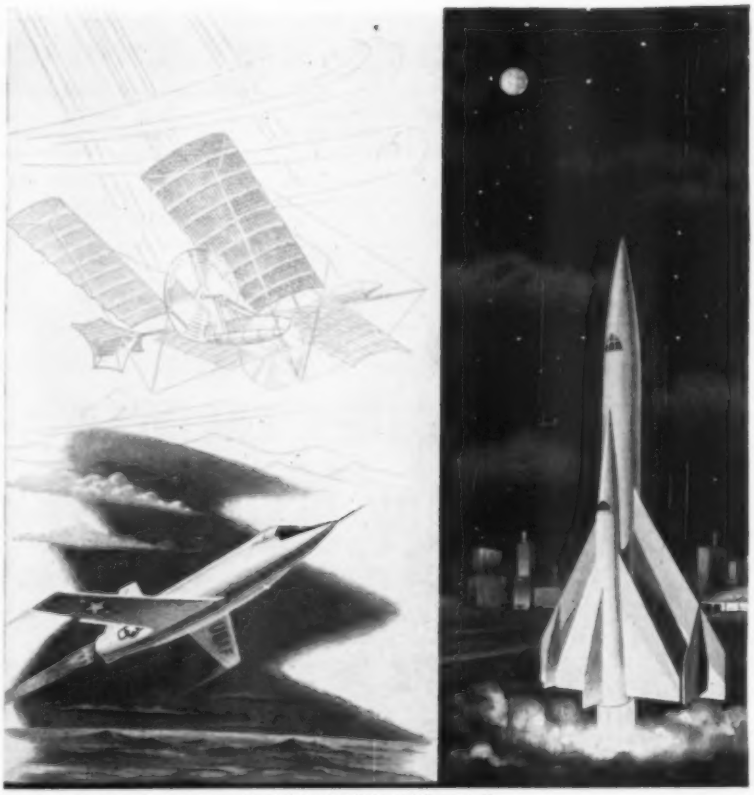
**Friedrich Krupp, Essen.** now uses a Learstar Mk. 1 business transport. Krupp chief pilot Capt. Marcell Jacob ferried the plane from Santa Monica to Germany, with stops at New York, Goose Bay and Keflavik at an average speed of 273 mph. including 40 min. holding time.

**Free airport deliveries** of parts and supplies in the metropolitan New York area are made by Van Dusen Aircraft Supplies' Eastern Division, Teterboro Airport, N. J. Supply house will deliver any of 7,000 items on mail or phone orders, by means of a regular truck service departing each week-day morning and stopping at some 15 airports.

**Working press** in the New York area can use a 1956 Piper Tri-Pacer Super Custom at nominal rates to learn how to fly or for pleasure or business trips. Plane, supplied by the Piper factory, is based at Safair Flying Service, Inc., Teterboro, N. J. this spring and summer. Nominal fee of $4/hr. covers fuel and insurance; instruction will be provided for $5/hr.

**First Collins WP101 C-band weather radar** for a Convair 340 has been installed by AiResearch Aviation Service, Los Angeles. The executive 340 is owned by Continental Oil Co.

**CESSNA 310 NO. 310** is picked up at the factory by 60-yr.-old Watson La Force (center), independent oil operator of Midland, Tex. La Force, who has been flying since 1917, will pilot the new twin on business trips throughout the South and Southwest, Wayne Chamney, (left) West Texas Cessna distributor, gives La Force the keys to his airplane, while Eldon Bloyd, regional sales manager for the Southwest, looks on.

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If *you* are a creative engineer with faith in your ideas and confidence in your ability to make them work, here's your opportunity to become a vital part of this great creative team. For our growth and diversification make it necessary to expand our engineering staffs at both Akron, Ohio, and Litchfield Park, Arizona. Opportunities are unlimited for creative engineers in all specialties.

Salaries and benefits are, of course, liberal. And if you wish to continue your academic studies, company-paid tuition courses leading to advanced degrees are available at nearby colleges.

For further information on *your* career opportunities at Goodyear Aircraft, write:

Mr. C. G. Jones, Personnel Department, Goodyear Aircraft Corporation, Akron 15, Ohio.

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Airborne Magnetic Tape Specialist

**Opening for engineer presently involved in the development and/or use of Magnetic Tape Recorders for Airborne Data Acquisition System. Must have a thorough knowledge of the present state of of the art and a good understanding of FM/FM and PWM systems.**

Telemeter Specialist

**3 years experience minimum. Must have a thorough understanding of FM/FM and PWM telemeter systems and be capable of directing the operation of the telemeter ground station and checkout of the airborne system. The opportunity exists for the advancement into the field of PWM and FM/FM to Digital Converters.**

## FLIGHT TEST INSTRUMENTATION DEVELOPMENT ENGINEER

**5-7 years experience. Must be capable of supervising the activities of a development group. A basic working knowledge of the fundamental laws of physics required together with heavy experience in advanced flight test instrumentation. Responsible for: (1) systems engineering on advanced instrumentation projects; (2) design and development of specialized instrumentation components not commercially available; (3) design and development of circuitry and techniques required to make various transducers compatible with various methods of recording.**

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**Assistant Chief Engineer**
*Administration*
**Mr. R. L. Bortner**

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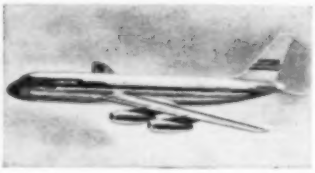

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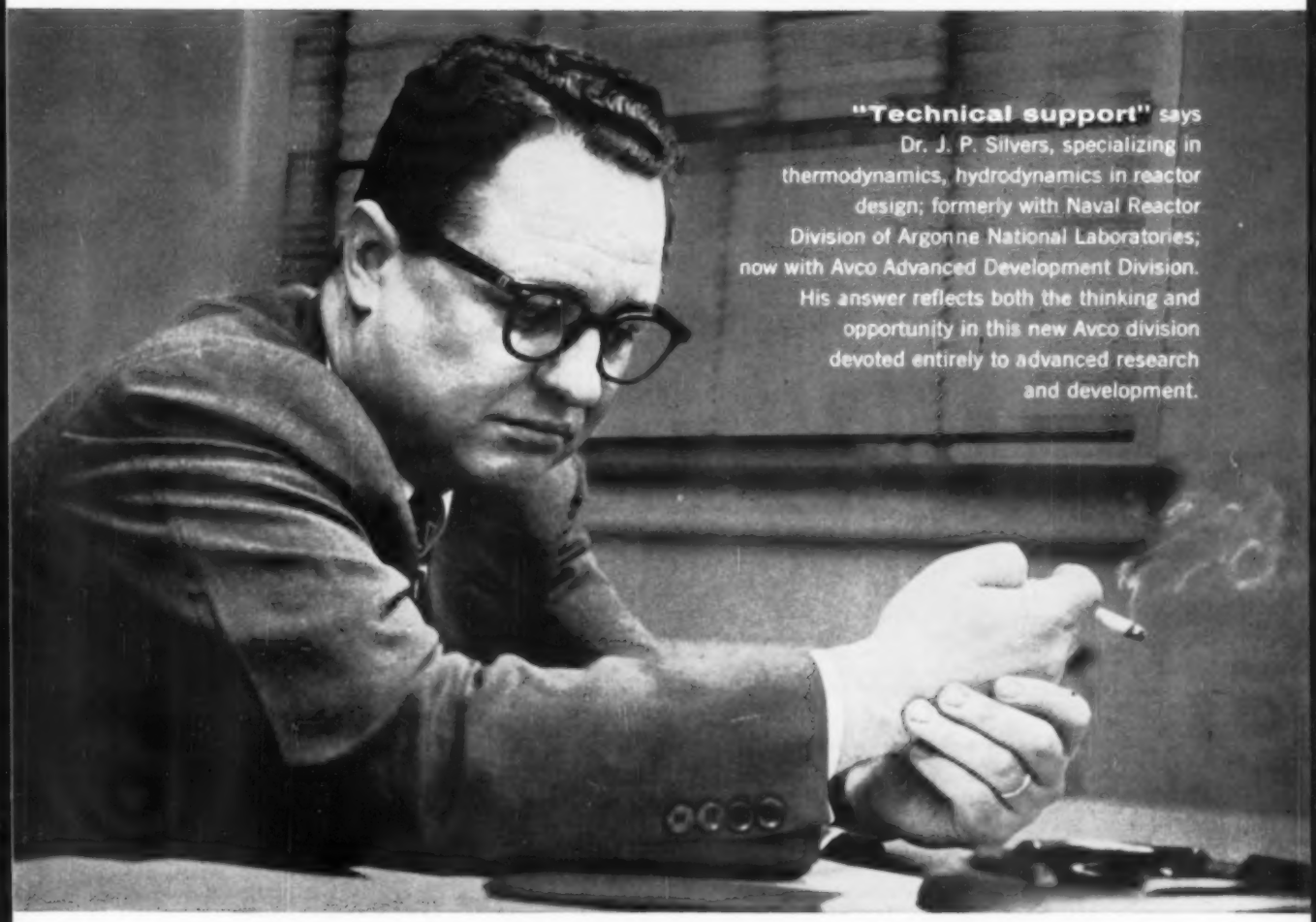

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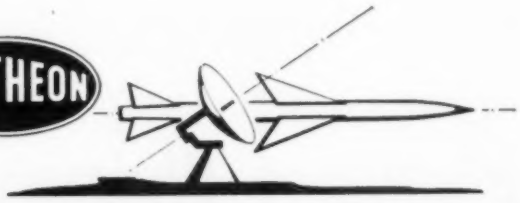

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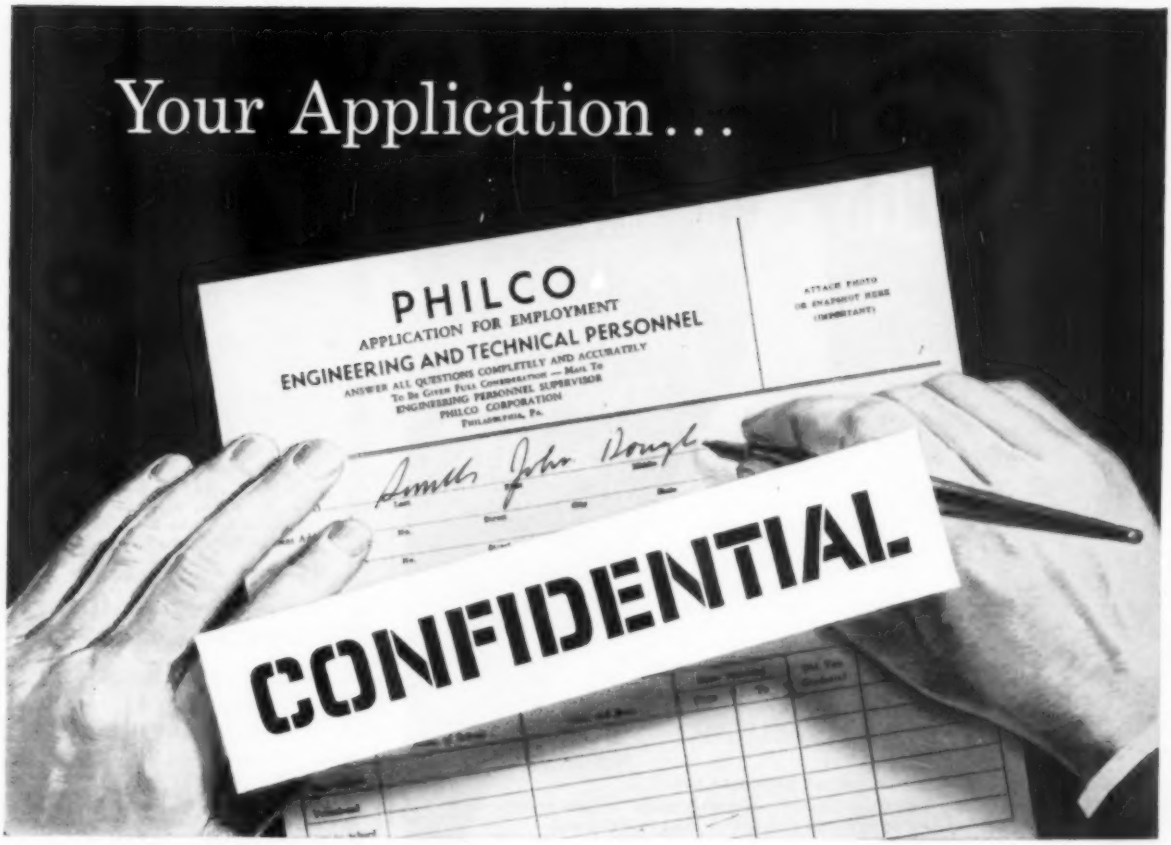


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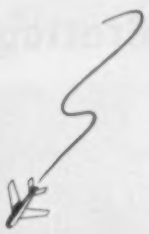

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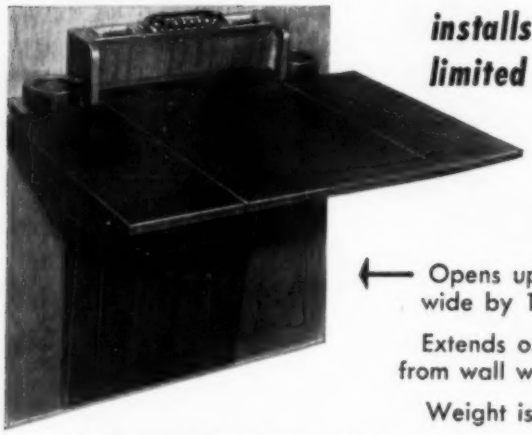

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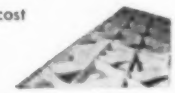

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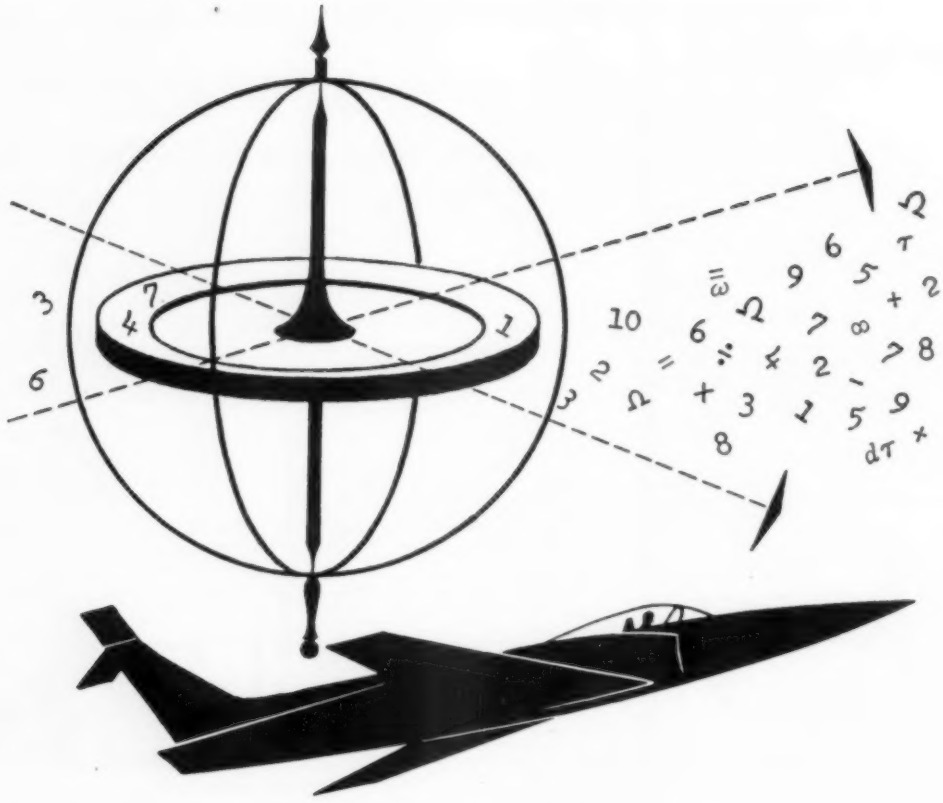

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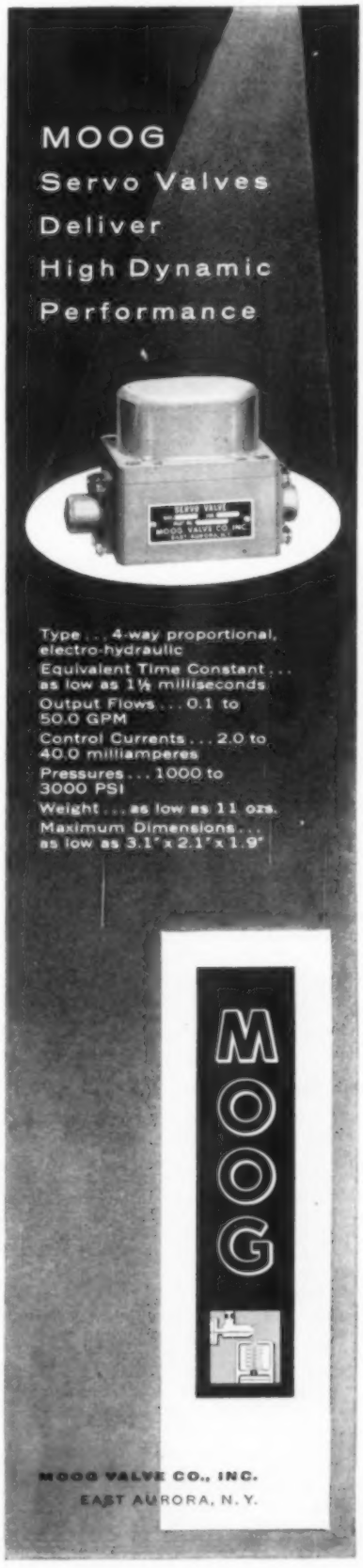
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# LETTERS

## Expectant Visitor

Today I received two tearsheets of your article "Inertial Guidance," which appeared in AVIATION WEEK, as well as your kind letter of March 13, 1956. I read it with great interest and was very much pleased. I wish to thank you for your thoughtfulness.

I do not think that I will visit the United States this year. For me as a gyroscope specialist, a visit to the United States would be only of interest if I had the opportunity to visit gyroscope workshops and to see gyroscopic devices.

I do not believe that I will get the necessary permission in such a short time, and I fear that I will have to postpone my trip to next year.

It will be my pleasure to meet you personally, and I certainly will pay you a visit while in the States.

With best personal regards.

M. SCHULER
Goettingen
West Germany

*(Dr. Maximillian Schuler in 1923 first suggested the idea of the "84-minute pendulum," which unlocked the door to practical inertial navigation systems for missiles and aircraft. Dr. Schuler still teaches at Goettingen University.—Ed.)*

## Fastener Status . . .

Refer to your issue of April 16 and article headed "USAF Hopes to Standardize Fasteners" (p. 55) and to your Editorial "Who is Running the Aircraft Industry?" (p. 21). The Technical Order (T. O. 44H1-1-9) issued August 2, 1955, states that the various types of fasteners now in service will be utilized until present stocks are exhausted and that replacement will be made with Pachmayr fasteners. It further states that the order is published under the authority of the Secretary of the Air Force.

### No Consultation

This order was issued without first consulting with the qualified engineers of the aircraft industry who were responsible for the performance of the products chosen for production and maintenance. It has also placed the present Secretary of the Air Force, Donald Quarles, in the embarrassing position of enforcing or cancelling an order for which he has had no responsibility.

When Quarles requested opinions through AMC from the airframe industry, the replies of 16 major companies objected to the T. O. giving engineering and policy reasons.

Your article did not state the fact that Air Force representatives accompanied Pachmayr salesmen with the obvious intent to influence the choice of this fastener by the airframe companies. It did not state that the Air Force wrote airframe companies urging them to consider its use on new designs. Significantly, it did quote W. A. McKinley, Assistant to the President of Pachmayr, that the fastener has 50 users, but he did not name them except for the Ryan Firebee. The article did not state that Pachmayr does not have production tooling for a general standardization program and that the price of the fastener, as quoted to the industry, is in the nature of three times the price of those being used in design, thus defeating Public Law #436. It is easily proven that this fastener will not reduce the catalog variations from 1,049 to 78 but would add another 78 bins at each maintenance center and would increase maintenance costs to the taxpayer by millions of dollars.

### Incentive Removed

If it is the intent and purpose to dictate by T. O.'s the choice of products to be used by capable design engineers, we have then removed incentive from the American way of life and have adopted the Communist principle of central control of industry. We then throw healthy competition out the window, and we all go to work for (what?) Government.

If this policy is continued, we should abandon temporary proprietorship and do away with our Patent Office and the incentive motif based upon *merit*.

It will be interesting to see how Mr. Quarles meets this type of military directive.

J. MILLS SUMMERS, President,
Camloc Fastener Corp.
22 Spring Valley Rd.
Paramus, N. J.

***Aviation Week welcomes the opinion of its readers on the issues raised in the magazine's editorial columns. Address letters to the Editor, Aviation Week, 330 W. 42 St., New York 36, N. Y. Try to keep letters under 500 words and give a genuine identification. We will not print anonymous letters, but names of writers will be withheld on request.***

## And AIA Role

On behalf of the National Aircraft Standards Committee, I would like to call your attention to a serious error in Bob Cushman's interesting fastener standardization story, as reported in the April 16 issue of AVIATION WEEK.

The article states that "fastener manufacturers objections (were submitted to the Air Force) . . . through the Aircraft Industries Association," and again "under sponsorship of AIA's National Aircraft Standards Committee . . . fastener firms sent out questionnaires to airframe fastener users."

### Aircraft Spokesman

These statements indicate that the AIA through its National Aircraft Standards Committee is spokesman for these fastener manufacturers. This association is spokesman for the aircraft industry and the National Aircraft Standards Committee speaks only for that segment of the aircraft industry from which its membership is drawn—namely, aircraft and missile designers and producers. No fastener manufacturers qualify for NASC membership, although they are interested, as suppliers to the aircraft industry, in the committee's deliberations.

For the record, NASC has figured twice on the subject of this Air Force proposal. The first occasion was last November, when the committee was informed of the existence of this Air Force Technical Order. The substance of the light response from aircraft manufacturers at the time was to the effect that this was an internal Air Force matter pertaining to the maintenance of their airplanes after production and delivery. The subject was dropped with no further action.

### USAF Requests

The more recent Committee action was our February reply to an official Air Force request for comments from the aircraft industry on the standardization proposal. Our reply, presenting views of the aircraft rather than fastener manufacturers, recognized the Air Force prerogative to use any fastener for replacement, but opposed the use of this fastener as a standard for aircraft production.

We would appreciate your assistance in correcting the erroneous impression that AIA or NASC is spokesman for companies whose products may be competitive with the Turnloc fastener.

S. D. DANIELS
Technical Service
Aircraft Industries Assn.
610 Shoreham Building
Washington 5, D. C.

## More British Reaction

Your editorial comment on world speed record letter (AW April 23, p. 178) shocks me. The grapes are sour aren't they? When an American aircraft beats the speed record now rightfully belonging to Great Britain we shall congratulate you and not take refuge in petty excuses. Until then you should give credit where credit is due.

BOWYER, Director,
Society of British Aircraft Constructors
London, England

## Willing Draftsman

All I read about is "Engineer shortage." I wonder how many "A" draftsmen there are like myself (without the benefits of a college education), who are willing, anxious and capable to advance further into the engineering field.

Sometimes I think the companies are too busy looking out into the colleges to see what experienced potential there is under their very noses.

After 15 years in aircraft with approximately 5 years of that in technical illustration, I'm wondering what the future is.

LEROY B. STELBASKY
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# LEACH CORPORATION / LEACH RELAY DIVISION

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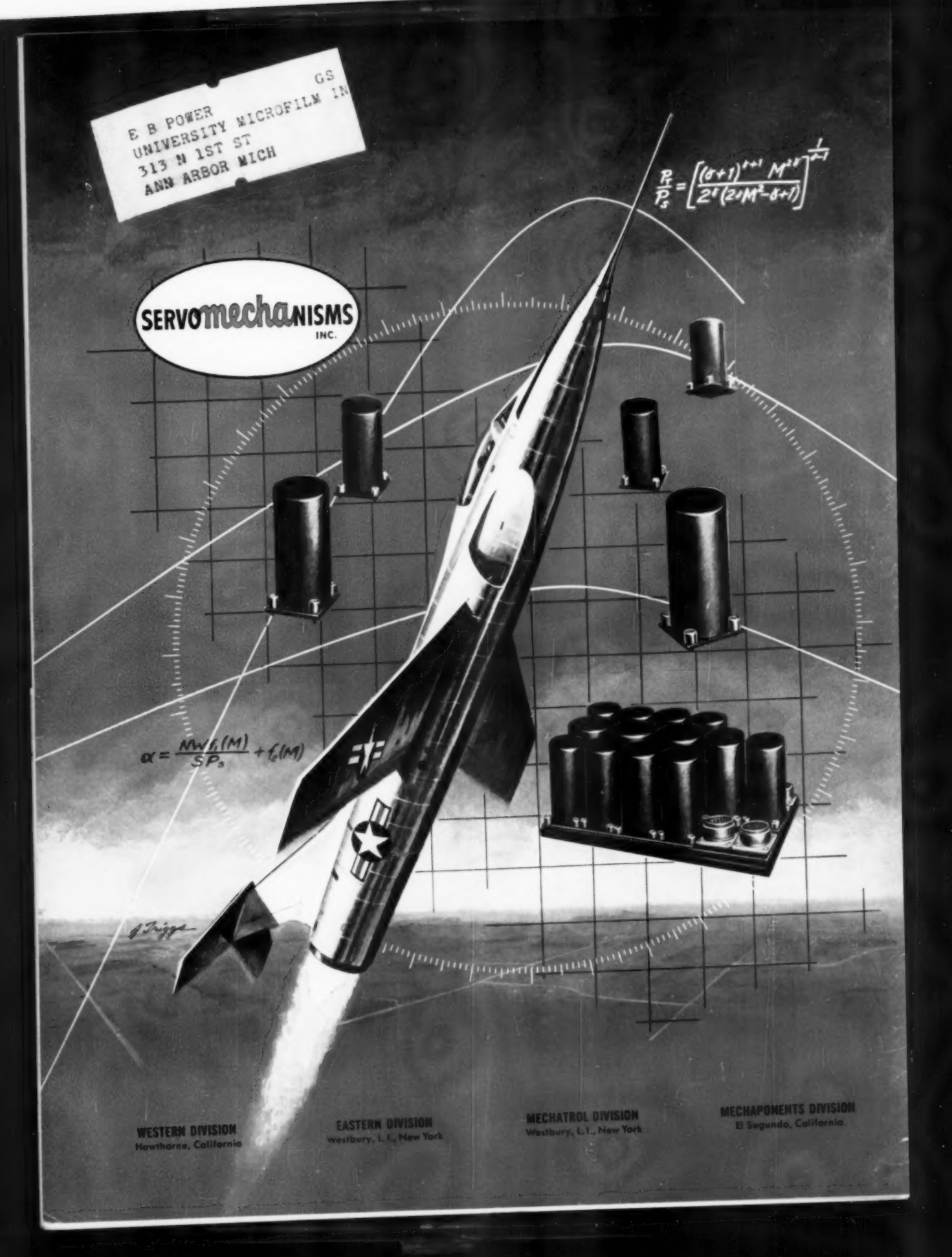
DISTRICT OFFICES AND REPRESENTATIVES IN PRINCIPAL CITIES OF U. S. AND CANADA

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